

Designers Who Don't Draw:
An Investigation into Sketch
Inhibition among
Undergraduate Designers

by

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Table of contents

ACKNOWLEDGEMENTS	VII
ABSTRACT	VIII
CHAPTER 1: INTRODUCTION	1
1.1. THE CONTEXT OF THE STUDY	1
1.2. THE THEORY	3
1.3. THE AIM	9
1.4. A DISCIPLINE NON-SPECIFIC APPROACH.....	11
1.5. TERMINOLOGY	13
1.6. A RESEARCH PARADOX: GROUNDED THEORY VERSUS THE PHD	13
1.7. THE INTENDED CONTRIBUTIONS TO NEW KNOWLEDGE.....	15
1.8. NAVIGATION OF THE DOCUMENT	16
CHAPTER 2: THE LITERATURE REVIEW	19
2.1. INTRODUCTION	19
2.2. THE METHOD	20
2.3. META-ANALYSIS OF THE LITERATURE.....	23
2.4. FINDINGS FROM THE LITERATURE	27
2.4.1. <i>Phase I findings: Sketching – Objective 1</i>	27
2.4.2. <i>Phase I findings: Sketching – Objective 2</i>	41
2.4.3. <i>Phase I findings: Sketching – Objective 3</i>	51
2.4.4. <i>Phase II findings: Sketch Inhibition - Objective 4</i>	65
2.4.5. <i>Phase II findings: Sketch Inhibition - Objective 5</i>	66
2.4.6. <i>Phase II findings: Sketch Inhibition - Objective 6</i>	70
2.5. IN CONCLUSION	72
CHAPTER 3: THE METHODOLOGY	76
3.1. INTRODUCTION	76
3.2. THE INITIAL METHODOLOGY	76
3.3. THE WRONG METHODOLOGY.....	78
3.4. BACK TO BASICS: THE POTENTIAL EPISTEMOLOGY.....	81
3.5. AN OBSERVATION OF DESIGN EPISTEMOLOGY	84
3.6. A QUALITATIVE APPROACH.....	85
3.7. THE POTENTIAL RESEARCH STRATEGIES	86
3.7.1. <i>Phenomenology</i>	87
3.7.2. <i>Grounded Theory</i>	89
3.7.3. <i>Thematic analysis</i>	94
3.7.4. <i>A comparative analysis of the proposed approaches</i>	96
3.8. THE PROPOSED METHODOLOGY	100
3.9. THE SEMI-STRUCTURED INTERVIEWS	101
3.9.1. <i>The questions</i>	101
3.9.2. <i>Sample size & saturation</i>	102
3.9.3. <i>Recruiting the subjects</i>	102
3.9.4. <i>The process</i>	104
3.9.5. <i>Preparation of the data</i>	104
3.9.6. <i>Analysis of the data</i>	104
3.10. THE LEARNING STYLE SURVEY.....	108
3.10.1. <i>Basis of the approach</i>	108
3.10.2. <i>The methodology</i>	108
3.10.3. <i>Sample size</i>	108
3.10.4. <i>Preparation and analysis of the data</i>	109

3.11.	THE LONGITUDINAL STUDY.....	109
3.11.2.	<i>Methodology.....</i>	109
3.11.3.	<i>Sample size & saturation.....</i>	110
3.11.4.	<i>The question.....</i>	110
3.11.5.	<i>Preparation and analysis of the data.....</i>	110
3.12.	CASE STUDY - LEICESTER SCHOOL OF MEDIA DRAWING CENTRE	110
3.12.1.	<i>Background to the method</i>	110
3.12.2.	<i>The method</i>	110
3.12.3.	<i>Preparation and analysis of the data.....</i>	111
3.13.	TESTING FRAMEWORK TOOLS: ACTION RESEARCH USING TEACHING & LEARNING PRACTICE	111
3.13.1.	<i>Background to the method</i>	111
3.13.2.	<i>The process</i>	112
3.13.3.	<i>Preparation & analysis of the data</i>	113
3.14.	PRESENTATION OF FINDINGS	113
CHAPTER 4: INTERVIEWS WITH EDUCATORS.....		114
4.1.	INTRODUCTION	114
4.2.	THE SAMPLE	114
4.3.	META-ANALYSIS OF THE INTERVIEW DATA.....	115
4.4.	THE FINDINGS	116
4.4.1.	<i>Initial perceptions of sketching</i>	117
4.4.2.	EDUCATOR PERCEPTIONS OF INDUSTRY	118
4.4.3.	<i>The extent of sketch inhibition.....</i>	119
4.4.4.	<i>Symptoms of inhibition in design output</i>	120
4.4.5.	<i>Behavioural symptoms.....</i>	121
4.4.6.	<i>Social issues.....</i>	126
4.4.7.	<i>Culture.....</i>	127
4.4.8.	<i>Gender.....</i>	128
4.4.10.	<i>Pre-university education</i>	129
4.4.11.	<i>Student recruitment.....</i>	133
4.4.12.	<i>Approaches to teaching</i>	135
4.4.13.	<i>Specific teaching tools.....</i>	137
4.4.14.	<i>Design v visualisation.....</i>	139
4.4.15.	<i>Teaching & learning environments</i>	139
4.4.16.	<i>Gamification of the learning process</i>	141
4.4.17.	<i>Quantity</i>	141
4.4.18.	<i>Speed of working.....</i>	142
4.4.19.	<i>Materials.....</i>	142
4.4.20.	<i>The sketch as a 3-D model</i>	144
4.4.21.	<i>Pastoral support.....</i>	144
4.4.22.	<i>Enculturation.....</i>	145
4.4.23.	<i>Digital tools.....</i>	146
4.5.	IN CONCLUSION	148
CHAPTER 5: INTERVIEWS WITH INDUSTRY INFLUENCERS.....		154
5.1.	THE SAMPLE	154
5.2.	META-ANALYSIS OF THE INTERVIEW DATA.....	154
5.3.	THE FINDINGS	155
5.3.1.	<i>Industry requirements.....</i>	155
5.3.2.	<i>Recruitment.....</i>	158
5.3.3.	<i>Sketching and drawing.....</i>	159
5.3.4.	<i>Digital tools.....</i>	161
5.3.5.	<i>Sketching and designing</i>	164
5.3.6.	<i>Inhibited graduates.....</i>	166
5.3.8.	<i>Higher education.....</i>	168
5.3.9.	<i>Client issues.....</i>	170
5.3.10.	<i>Graduate attitudes.....</i>	171

5.3.11.	<i>Materials</i>	171
5.4.	IN CONCLUSION	172
CHAPTER 6: INTERVIEWS WITH STUDENTS.....		176
6.1.	THE SAMPLE	176
6.2.	META-ANALYSIS OF THE INTERVIEW DATA	176
6.3.	THE FINDINGS	177
6.3.1.	<i>Teaching of sketching in higher education</i>	177
6.3.2.	<i>Awareness of sketch inhibition</i>	179
6.3.3.	<i>Childhood experience</i>	180
6.3.4.	<i>Routes into higher education</i>	181
6.3.5.	<i>Attitudes to sketching</i>	182
6.3.6.	<i>Alternative communication tools</i>	183
6.3.7.	<i>Materials</i>	184
6.3.8.	<i>Fear issues</i>	185
6.3.9.	<i>Peer support</i>	187
6.3.10.	<i>Cognitive issues</i>	188
6.3.11.	<i>Tutorial issues</i>	189
6.3.13.	<i>Digital tools</i>	190
6.4.	IN CONCLUSION	192
CHAPTER 7: LEARNING STYLE SURVEY & LONGITUDINAL STUDY		197
7.1.	LEARNING STYLE SURVEY - INTRODUCTION	197
7.1.1.	<i>Findings from the literature</i>	198
7.1.2.	<i>Findings</i>	200
7.1.3.	<i>Conclusions</i>	204
7.2.	LONGITUDINAL STUDY – INTRODUCTION	205
7.2.1.	<i>The literature</i>	206
7.2.2.	<i>Findings</i>	206
7.2.3.	<i>Conclusions</i>	207
CHAPTER 8: CASE STUDY: LEICESTER MEDIA SCHOOL DRAWING CENTRE.....		208
8.1.	INTRODUCTION	208
8.2.	THE STRUCTURE OF LMSDC	208
8.3.	FINDINGS FROM THE INTERVIEW: THE ISSUES	209
8.3.1.	<i>Inhibition</i>	209
8.3.2.	<i>The demographic</i>	209
8.3.3.	<i>Student maturity</i>	209
8.3.4.	<i>Pre-university education</i>	210
8.3.5.	<i>Teaching & learning within higher education</i>	211
8.4.	THE TEACHING & LEARNING MODEL AT LMSDC – A POSSIBLE SOLUTION TO SKETCH INHIBITION	212
8.4.2.	<i>Materials</i>	215
8.4.3.	<i>Feedback from students taught at LMSDC</i>	216
8.5.	CONCLUSIONS.....	218
CHAPTER 9: FULFILLING THE OBJECTIVES		221
9.1.	INTRODUCTION	221
9.2.	THE OBJECTIVES.....	221
9.2.1.	<i>Objective 1</i>	221
9.2.2.	<i>Objective 2</i>	223
9.2.3.	<i>Objective 3</i>	225
9.2.4.	<i>Objective 4</i>	229
9.2.5.	<i>Objective 5</i>	229
9.3.	A GROUNDED THEORY OF SKETCH INHIBITION	233
9.3.1.	<i>Objective 6:</i>	234
9.4.	SCOPE AND PURPOSE OF THE FRAMEWORK	237
9.4.1.	<i>Utilisation of the framework</i>	237
9.4.2.	<i>Contextual inputs to the framework</i>	240
9.5.1.	<i>Level 1: Management at strategic level within HE institutions</i>	241

9.5.2.	<i>Level 2: Management through studio-based pedagogy</i>	244
9.5.3.	<i>Level 3: Management by the individual</i>	249
9.6.	TESTING FRAMEWORK TOOLS: ACTION RESEARCH USING TEACHING & LEARNING PRACTICE	250
9.6.1.	<i>Observations of the teaching & learning practice</i>	251
9.7.	CONCLUSIONS.....	255
9.7.1.	<i>Module feedback</i>	255
9.8.	CONCLUSIONS.....	258
CHAPTER 10: CONCLUSIONS & FINAL THOUGHTS		260
10.1.	INTRODUCTION	260
10.3.	OBSERVATIONS OF THE METHODOLOGY.....	261
10.3.1.	<i>Personal agenda and bias</i>	263
10.4.	OBJECTIVE 7: <i>TO WHAT EXTENT DOES THE USE OF GROUNDED THEORY CONFLICT WITH THE REQUIREMENTS OF TRADITIONAL PHD STUDY?</i>	264
10.4.1.	<i>The research proposal</i>	264
10.4.2.	<i>The management of data</i>	265
10.4.3.	<i>Structure of the thesis</i>	265
10.4.4.	<i>Timeframe of PhD study</i>	266
10.4.5.	<i>The potential benefits of complexity theory to Grounded Theory research</i>	266
10.4.6.	<i>Conclusion</i>	266
10.5.	LIMITATIONS OF THE STUDY	267
10.6.	RECOMMENDATIONS FOR FURTHER RESEARCH.....	268
10.7.	PROPOSALS FOR FUTURE OUTPUT.....	270
10.8.	FINAL WORDS	271
BIBLIOGRAPHY		273

APPENDICES - PRESENTED ON ACCOMPANYING DISK

APPENDIX 1 - PUBLICATIONS DURING THE RESEARCH	ERROR! BOOKMARK NOT DEFINED.1
APPENDIX 2 - KEYWORDS USED FOR LITERATURE SEARCH	Error! Bookmark not defined.4
APPENDIX 3 - INTERVIEW QUESTION DEVELOPMENT	ERROR! BOOKMARK NOT DEFINED.5
APPENDIX 4 - SEMI-STRUCTURED INTERVIEWS	ERROR! BOOKMARK NOT DEFINED.8
APPENDIX 5 - ETHICAL APPROVAL DOCUMENTS	ERROR! BOOKMARK NOT DEFINED.1
APPENDIX 6 – INTERVIEWS WITH EDUCATORS.....	ERROR! BOOKMARK NOT DEFINED.0
APPENDIX 7 - INTERVIEWS WITH INDUSTRY	ERROR! BOOKMARK NOT DEFINED.6
APPENDIX 8 – INTERVIEWS WITH STUDENTS: SKETCH INHIBITED	ERROR! BOOKMARK NOT DEFINED.3
INTERVIEWS WITH STUDENTS: SKETCH FLUENT.....	ERROR! BOOKMARK NOT DEFINED.3
APPENDIX 9 – LEARNING STYLE QUESTIONNAIRES.....	ERROR! BOOKMARK NOT DEFINED.7
APPENDIX 10 - LEARNING STYLE TABLE OF RESULTS.....	ERROR! BOOKMARK NOT DEFINED.3

List of Figures

FIGURE 1: MODEL OF THE DESIGN PROCESS. SOURCE: BAGNALL &, KOBURG 1990.	4
FIGURE 2: MESAROVIC'S CYCLICAL PROCESS MODEL. SOURCE: DUBBERLY, 2004.	4
FIGURE 3: PROCESS MODEL SHOWING CONSCIOUSNESS TYPES. SOURCE: ALEXANDER 1964.	5
FIGURE 4: PROCESS MODEL SHOWING CONVERGENT & DIVERGENT ACTIVITY. SOURCE: BENATHY, 1996.	6
FIGURE 5: PROCESS MODEL SHOWING CONVERGENT & DIVERGENT ACTIVITY. SOURCE: CROSS, 2000.	6
FIGURE 6: MODEL OF C-K THEORY SHOWING POTENTIAL POSITION & EFFECTS OF SKETCH INHIBITION. SOURCE: ADAPTED FROM HATCHUEL & WEIL, 2003.	7
FIGURE 7: MODEL OF UNCERTAINTY DRIVEN ACTION (UDA) TO ILLUSTRATE THE POTENTIAL POSITION AND EFFECTS OF SKETCH INHIBITION. SOURCE: CASH & KREYE, 2017.	9
FIGURE 8: REQUIRED THESIS STRUCTURE. SOURCE: DE MONTFORT UNIVERSITY, N.D.	14
FIGURE 9: MIND MAPS CREATED TO IDENTIFY GAPS IN KNOWLEDGE DURING LITERATURE SEARCH. SOURCE: THE AUTHOR. ...	21
FIGURE 10: MIND MAP CREATED TO IDENTIFY GAPS IN KNOWLEDGE DURING LITERATURE SEARCH. SOURCE: THE AUTHOR.	22
FIGURE 11: VOLUME OF LITERATURE ACCESSED ACCORDING TO DISCIPLINE DURING THE COURSE OF THE STUDY. SOURCE: THE AUTHOR - FIRST PUBLISHED IN THURLOW, L. & FORD, P, (2018B).....	24
FIGURE 12: ILLUSTRATION OF THE NUMBER OF LITERATURE SOURCES ASSIGNED TO EMERGING NODES. SOURCE: THE AUTHOR - FIRST PUBLISHED IN THURLOW, L. & FORD, P, (2018B).....	25
FIGURE 13: ILLUSTRATION OF THE NUMBER OF CODINGS PLACED INTO EMERGING NODES. SOURCE: THE AUTHOR - FIRST PUBLISHED IN THURLOW, L. & FORD, P, (2018B)	26
FIGURE 14: TAXONOMY OF VISUAL DESIGN REPRESENTATIONS. SOURCE: PEI ET AL, 2011	35
FIGURE 15: THE INFORMED DESIGN TEACHING & LEARNING MATRIX, REPRESENTING THE SYMPTOMS OF SKETCH INHIBITION THROUGHOUT THE DESIGN PROCESS – AS SHOWN BY THE SHADED AREAS.	69
FIGURE 16: INITIAL METHODOLOGY PRESENTED FOR FORMAL REVIEW. SOURCE: THE AUTHOR	77
FIGURE 17: COMPARISON OF THE GLASERIAN AND STRAUSSIAN APPROACHES TO GROUNDED THEORY. SOURCE: JONES, 2011	93
FIGURE 18: METHODOLOGY DECISION-MAKING TOOL. SOURCE: BASED UPON STARKS & TRINIDAD, 2007.....	99
FIGURE 19: THE PROPOSED METHODOLOGY USING A GROUNDED THEORY APPROACH. SOURCE: THE AUTHOR.....	101
FIGURE 20: EMERGENCE OF INITIAL THEMES FROM THE DATA ACCORDING TO STRAUSS' METHOD OF OPEN CODING. SOURCE: THE AUTHOR.	105
FIGURE 21: AXIAL CODING USED TO IDENTIFY CATEGORIES AND RELATIONSHIPS WITHIN THE DATA. SOURCE: THE AUTHOR.	106
FIGURE 22: DEVELOPMENT OF THEMES INTO A NARRATIVE OF SKETCH INHIBITION. SOURCE: THE AUTHOR.	107
FIGURE 23: POSITION OF THE SEMI-STRUCTURED INTERVIEWS WITHIN THE GROUNDED THEORY APPROACH. SOURCE: THE AUTHOR.....	114
FIGURE 24: AXIAL CODING OF EMERGENT THEMES FROM THE DATA. SOURCE: THE AUTHOR.....	116
FIGURE 25: AXIAL CODING OF EMERGENT THEMES FROM THE DATA. SOURCE: THE AUTHOR.....	155
FIGURE 26: AXIAL CODING OF THE EMERGENT THEMES FROM THE DATA. SOURCE: THE AUTHOR.....	177
FIGURE 27: POSITION OF THE LEARNING STYLE SURVEY WITHIN THE GROUNDED THEORY APPROACH. SOURCE: THE AUTHOR.	197
FIGURE 28: RESULTS OF THE VARK QUESTIONNAIRE AMONG THE SKETCH FLUENT SET. SOURCE: THE AUTHOR.	201
FIGURE 29: RESULTS OF THE VARK QUESTIONNAIRE AMONG THE SKETCH INHIBITED SAMPLE. SOURCE: THE AUTHOR.	202
FIGURE 30: RESULTS OF THE FELDER SOLOMON LEARNING STYLE INVENTORY AMONG THE FLUENT SET. SOURCE: THE AUTHOR.	203
FIGURE 31: RESULTS OF THE FELDER SOLOMON LEARNING STYLE INVENTORY AMONG THE SKETCH INHIBITED SAMPLE. SOURCE: THE AUTHOR.	204

<i>FIGURE 32: POSITION OF THE LONGITUDINAL STUDY WITHIN THE GROUNDED THEORY APPROACH. SOURCE: THE AUTHOR.</i>	206
<i>FIGURE 33: POSITION OF THE CASE STUDY WITHIN THE GROUNDED THEORY APPROACH. SOURCE: THE AUTHOR.</i>	208
<i>FIGURE 34: DEVELOPMENT OF THE FRAMEWORK BASED UPON THE EMERGENCE OF THEMES. SOURCE: THE AUTHOR –</i> <i>ORIGINALLY PUBLISHED IN THURLOW & FORD, 2018A.</i>	235
<i>FIGURE 35: MIND MAP TO SHOW AXIAL AND SELECTIVE CODING OF THEMES DURING DEVELOPMENT OF THE PEDAGOGIC</i> <i>FRAMEWORK. SOURCE: THE AUTHOR.</i>	236
<i>FIGURE 36: MIND MAP TO SHOW AXIAL AND SELECTIVE CODING OF THEMES DURING DEVELOPMENT OF THE PEDAGOGIC</i> <i>FRAMEWORK. SOURCE: THE AUTHOR.</i>	236
<i>FIGURE 37: PROPOSED PEDAGOGIC FRAMEWORK FOR SKETCH INHIBITION. SOURCE: THE AUTHOR.</i>	239
<i>FIGURE 38: POSITION OF THE ACTION RESEARCH WITHIN THE GROUNDED THEORY APPROACH. SOURCE: THE AUTHOR.</i>	251
<i>FIGURE 39: RELATIVE VOLUMES OF USEFUL DATA ACCORDING TO METHOD. SOURCE: THE AUTHOR.</i>	262
<i>FIGURE 40: POTENTIAL FOR FUTURE RESEARCH INTO SKETCH INHIBITION. SOURCE: THE AUTHOR.</i>	269

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Abstract

Sketch inhibition in undergraduate designers is a phenomenon widely acknowledged by educators, yet one garnering little attention from the academy. Defined as a reluctance or inability to use sketching effectively, it impacts negatively upon design ideation and the representation, evaluation and communication of information essential for successful design.

The uniqueness of sketching was confirmed by the study; as a personalised icon-based language, a method of cognitive support for mental imagery and a tool for analysis. Ideation - the combination of intrinsically linked micro-activities within mental imagery and their representation - relies upon effective offloading of the working memory, the sketch being an irreplaceable tool for this purpose.

Sketch inhibition is a complex behavioural phenomenon with single or multiple causes. These include, but are not limited to, skill-set deficiency, social anxiety and previous negative educational experience. Symptoms include reluctance to engage, deferral to other tools and poor quality design output. Effects are embodied in the inability to conceptualise and develop design information effectively, with impact graduate employability and commercial activity.

Although purported to be integral to design higher education, considerable problems exist regarding its teaching and use at strategic, institutional and pedagogic levels. This includes the erroneous assumption that sketching is an intuitive activity that need not be taught. Examples of best practice suggest that, much like language, it needs to be formally taught and practised in order to develop both vocabulary and fluency in its use, in order that it can support design ideation successfully.

This study applies a Grounded Theory approach to investigation of sketch inhibition and subsequently formulates a theory of the phenomenon. A pedagogic framework for

sketch inhibition within design education is presented and evaluated, suggesting the command of it is possible - and on the part of the sufferer, even enjoyable.

Chapter 1: Introduction

“Sketching skills are an essential tool for industrial designers, just as spelling and grammar are for writers... During the early stages of the design process, designers must record ideas rapidly to explore a wide range of ideas in a short time. The more ideas, the better the final design.”

(Lambert & Firth 2006)

1.1. The context of the study

Sketch inhibition, a widely observed yet little studied phenomenon within design higher education appears to be growing. Educators constantly bemoan its effects; its existence among student designers is extensive and can be widely observed across disciplines and institutions. It appears to affect the behaviour of sufferers, symptoms varying widely, a constant of this being reduced quality of design output. However, there exist virtually no formal studies of it, and very few tested methods for its management.

The motivation for undertaking this study was personal, teaching within design higher education since 1999 and constantly observing students' issues with sketching. The numbers of students having no relationship with drawing or sketching is growing. Of those who do, few use it effectively, and even fewer understand its functions. Similarly, tutors appear less equipped to teach such skills; the assumption often being that students will find their own way. Thus, the need for this study became increasingly pressing.

Having practiced commercial design for over twenty years, it was clearly apparent that industry's need for good drawing and sketching has never waned. Despite the growth

of digital tool use, hand drawn sketches are still irreplaceable during the ideation process and are increasingly requested by clients during the development and presentation of designs. However, this is not reflected in higher education; students' reliance on computers appearing greater than ever.

As an example, several observations were recorded in 2015, prior to this study in order to establish the existence of sketch inhibition. These were made during studio teaching sessions at De Montfort University and the University of Suffolk and are presented below:

"A group of thirteen postgraduate design students were asked if they could draw: only two said yes."

"A postgraduate student presented her design development... a collection of images cut from magazines and lifted from internet together with a set of CAD produced plans... it became apparent that the design bore no relationship to the reference material; she was unable provide an explanation as to how her concept had developed."

"A group of undergraduate interior design students were required to design a living space within a 6 m cube; their conceptualisations developed using manual techniques including sketching and model-making. Several students refused to engage in the activity, (preferring to play with their mobile phones instead)."

"One student attempted to draw a cube in perspective using a child's set square. Half an hour later he was still struggling to create the shape."

From this limited set of observations alone, it was clear that sketch inhibition was alive and well and affecting the ideation output of those it influenced, raising questions: *Why do students avoid drawing? Are they afraid of something – if so, what, and can this be rectified?*

All this, of course, assumed that sketching during the ideation process was necessary in the first place. This assumption needed to be tested: *Was sketching even relevant to contemporary practice? Were there other more effective methods of ideation and concept development than traditional sketching? If so what were these?*

Considering sketch inhibition at the level of the institution or individual was of primary interest, however, its effect upon the industry would need to be considered. Apart from that already observed, were there wider implications of sketch inhibition for design industries and possibly, economies? The World Intellectual Property Organisation, described design as, *“the central factor of innovative humanization of technologies and the crucial factor of cultural and economic exchange,”* (p20), and playing an *“increasingly important role in the world economy,”* (p19). Their indicators revealed that the geography of innovation had shifted in recent years: *“for the first time in 2011, more patents were filed at the patent office of China than at any other office in the world... in the 100 years before 2011, only three patent offices had occupied this position – those of Germany, Japan and the United States,”* (p3). Additionally, and more recently, *“offices of other middle-income countries, such as Bangladesh, India, Mexico, Pakistan, the Philippines and Turkey, have also seen strong filing growth,”* (World Intellectual Property Organization 2014, p43). If sketch inhibition affected the quality and output of designers, could it affect the performance of entire industries and nations within a global context?

1.2. The theory

The basis for the study was unusual, there being no extant theory of sketch inhibition from which to start. Despite this, an understanding of sketching in relation to design theory was important to establish a foundation for the study. Copious models illustrate the design process, examples of which are considered here – however, and unsurprisingly, none specifically refer to sketching activity, (it being a micro-process within other activities).

According to Thurlow & Ford, (2018a), theoretical models have historically presented over-simplified linear activity, heavily reliant upon the analysis and synthesis, but have lacked evidence of the close relationship between cognition and creativity.

Bagnall & Koberg (1990), presented in figure 1, demonstrates this type of approach.

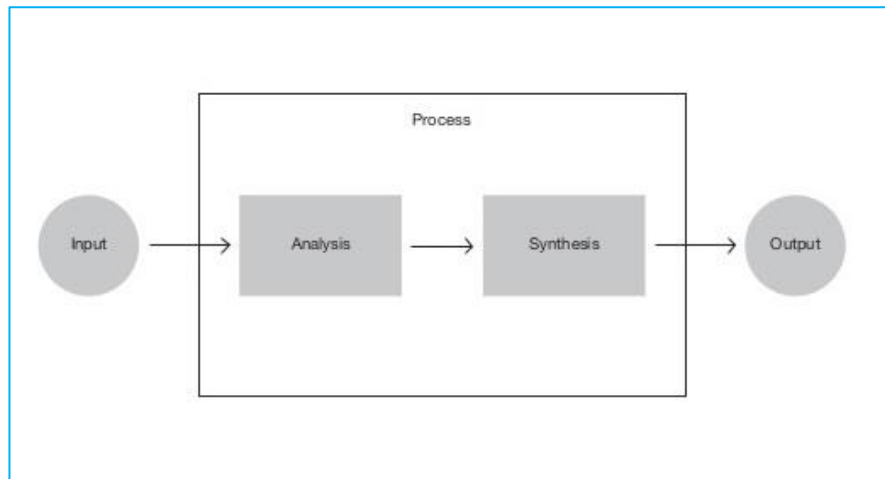


Figure 1: Model of the design process. Source: Bagnall &, Koburg 1990.

Mesarovic's (1964) model, (from Dubberly 2004), presented a cyclical process involving feedback loops, (see figure 2), being one of few models demonstrating the iterative nature of design process. Alexander's (1964) model demonstrated levels of consciousness (figure 3). However, none of these refer to the extent of cognitive and feedback activity for which sketching was necessary.

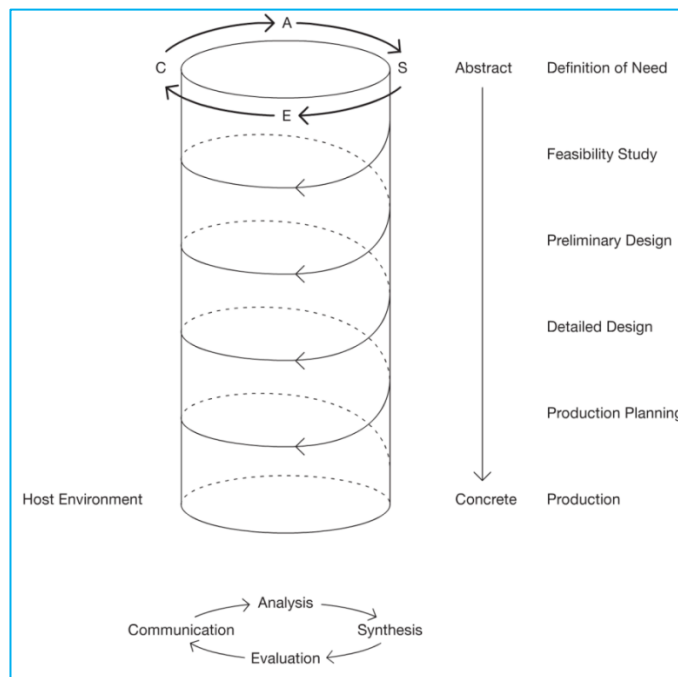


Figure 2: Mesarovic's cyclical process model. Source: Dubberly, 2004.

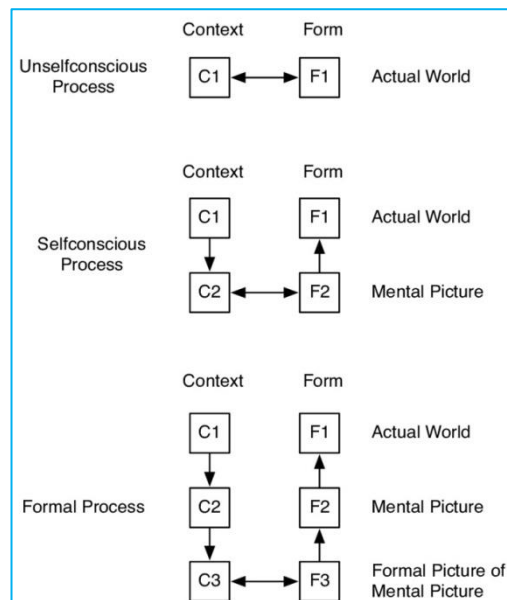


Figure 3: Process model showing consciousness types. Source: Alexander 1964.

Convergent and divergent activities of the design process were more recently modelled by Benathy (1996) and Cross (2000), (see figures 4 &5), again, identifying the extent and type of information being handled, but failing to consider designer cognition. Where the cognitive functions of the design process have been considered by Suwa & Tversky's (1997) conceptual dependency model and Goldschmidt's (2014) linkography, neither explicitly present the position and relationship of sketching within these.

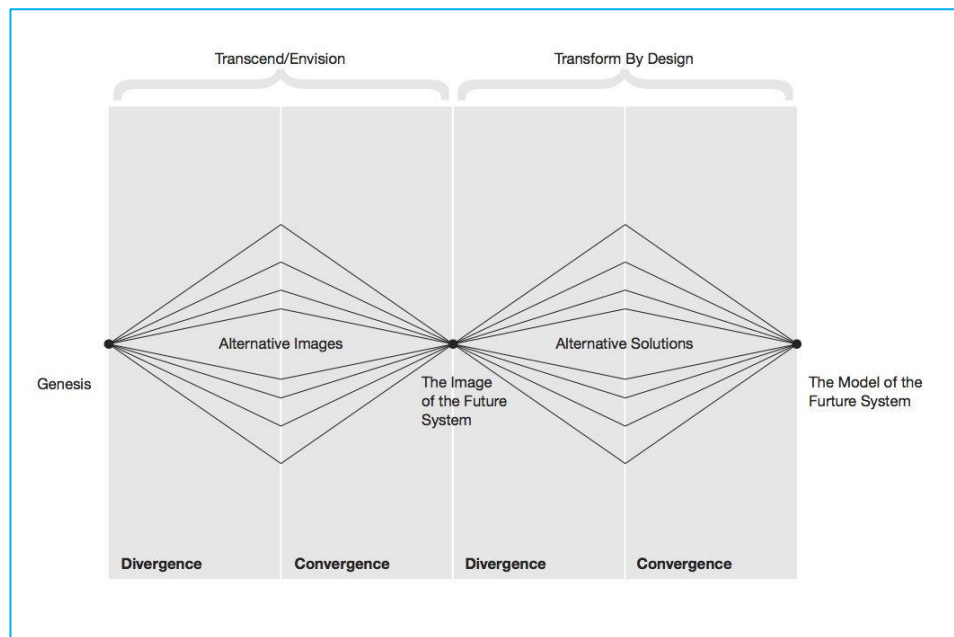


Figure 4: Process model showing convergent & divergent activity. Source: Benathy, 1996.

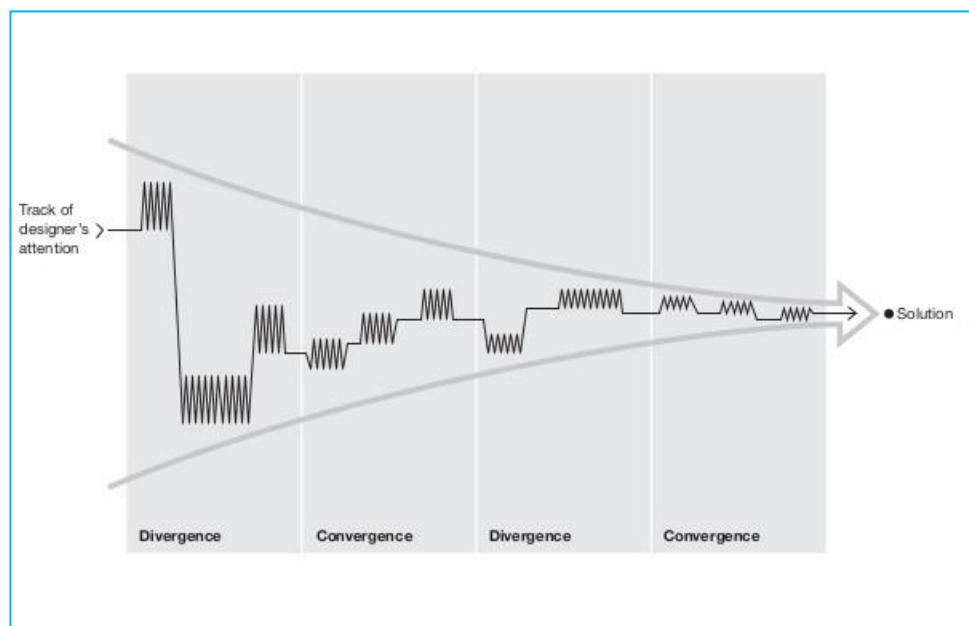


Figure 5: Process model showing convergent & divergent activity. Source: Cross, 2000.

Most models of design theory refer to externalisations of the design process. Hatchuel & Weil's (2003) C-K theory is more cognition-centric, demonstrating that, *“creative thinking and innovation are not external to design theory but are part of its central core,”* (p2)

and appeared to offer a potential underpinning to the study. Its central tenet considered the relationship between knowledge and concept: “*design is a process by which something unknown can intentionally emerge from what is known,*” (p2). ‘K’ is *knowledge space*; this, they believe to be neglected by the literature, being “*the space of propositions that have a logical status for a designer... it is impossible to define design without such referring space,*” (ibid). ‘C’ is the *concept* – “*a proposition or a group of propositions that have no logical status in K... when a concept is formulated it is impossible to prove that it is a proposition of K,*” (p5). The nebulous relationship between Concept and Knowledge space (unlike previous theoretical models), suggested that sketching, and by default, sketch inhibition could be identified, potentially interfering in the relationship between knowledge and concept, concept and knowledge and, concept and concept, (see figure 6).

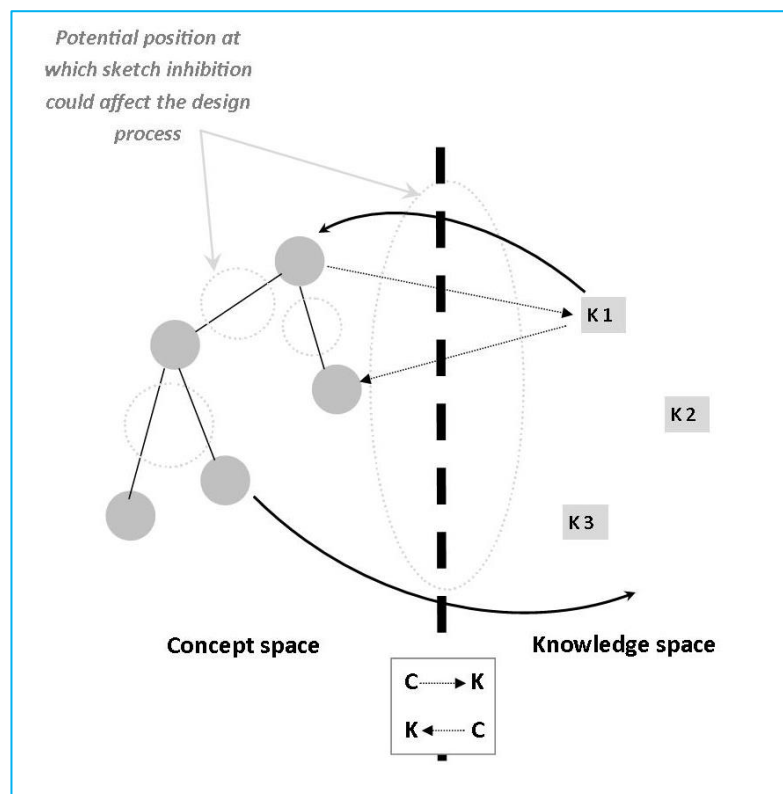


Figure 6: Model of C-K theory showing potential position & effects of sketch inhibition. *Source:* Adapted from Hatchuel & Weil, 2003.

Similarly, Cash & Kreye's (2017) recent theory of Uncertainty Driven Action, (UDA) considered previous models of design and appeared to be the most efficacious for this study. It suggested the design process is driven by uncertainty perception and addressed through three specific domains of activity: *information action*, *knowledge sharing action* and *representation action*. They acknowledged that sketching activity formed part of the *representational* stage of the process:

“representation action is often associated with knowledge structures and the exploration of the design... and provides a cognitively economic means of externalising... described via formalisms... where an individual uses the interplay between internal/external representations to directly support cognition and develop understanding ... representation actions deal with external representations... in numerous contexts e.g. via gesture... prototyping... or sketching,”(p21-22).

They also alluded to, but failed to explicitly acknowledge its position within the *knowledge sharing* domain: *“knowledge-sharing action connects to design formalisms at all levels of description,”* (p21). They referred to,

“the need to support designers in sharing and capturing knowledge... although knowledge-sharing action is typically part of an interpersonal exchange it can also be captured in asynchronous modes, where the addressee is unknown or simply imagined, such as in personal letters or journals,” (p21),

...thus acknowledging the need to record such information – and where the sketch would be of relevance. Cash & Kreye's (2017) model was considered in respect of sketch inhibition within the *representation action* domain. Figure 7 is a revised version of that model, demonstrating that sketch inhibition could affect representation action and the relationship between cognition and representation.

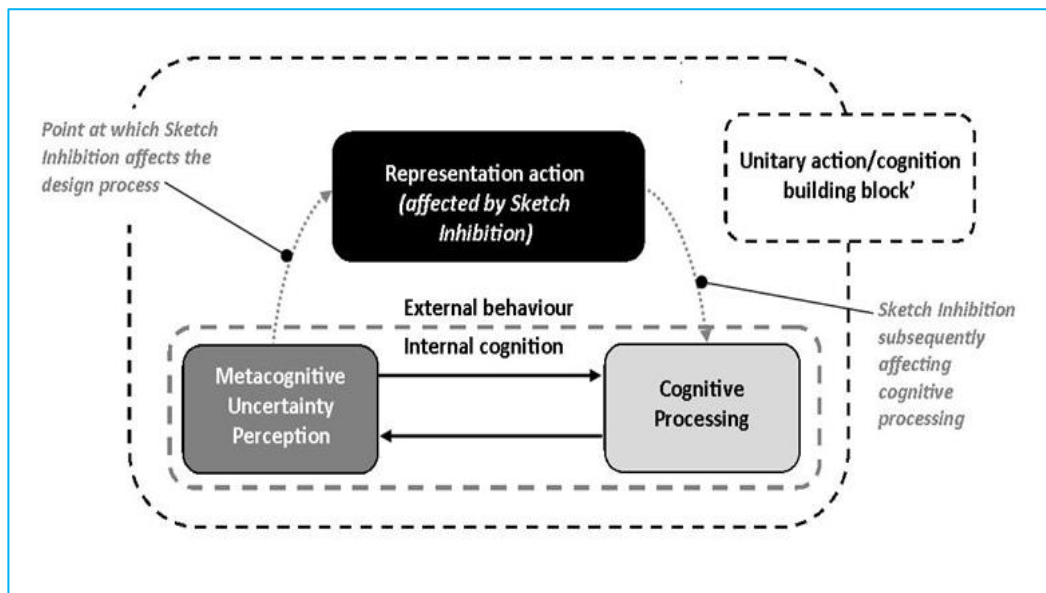


Figure 7: Model of Uncertainty Driven Action (UDA) to illustrate the potential position and effects of sketch inhibition. Source: Cash & Kreye, 2017.

The absence of a theory of sketch inhibition within the available theoretical material presented the opportunity to add to the debate. Hatchuel & Weil (2003) and Cash & Kreye's (2017) models provided something of a starting point: if sketching as a tool for cognitive and representational activity, (and by default, sketch inhibition), could be identified within their models, the suggestion that it could be managed was not unreasonable. With this in mind, the aim of the study was developed.

1.3. The Aim

To develop a theory of sketch inhibition leading to a pedagogic framework for design education.

The aim was developed into individual areas requiring investigation within the remit of an indicative study. These requirements are presented below, together with the individual objectives arising from them.

Requirement: The need to establish whether is sketching necessary for ideation: the effectiveness of other tools could make them more appropriate. If sketching *is* essential,

consider the role(s) it plays during ideation that cannot be supported by other tools. This led to development of **Objective 1:** *To explore and evaluate the specific nature, scope, functions and benefits of sketching activity, the purpose it fulfils within the design process and whether it is a necessary part of contemporary design practice.*¹

Requirement: Assuming its indispensability, consider what sketching actually *does* for the designer. Identify the micro-activities and processes it supports, i.e.; the inner workings of the designer's mind during ideation that are embodied and externalised by the sketch. This led to development of **Objective 2:** *To explore the internal dialogue and processes of the designer during the design ideation process.*

Requirement: Consider how ideation sketching is perceived within higher education by students and educators. Consider the extent of its use and compare this with other ideation tools if they exist - is it even relevant to current practice? Has its position changed over time and what had caused this? This led to development of **Objective 3:** *To establish the current position and status of sketching within contemporary design higher education alongside other concept development tools.*

Requirement: Existence of sketch inhibition already identified by initial empirical data but necessary to consider its extent. Does it affect design behaviours, processes and output - if so how? Players identified: educators, (who witness it) students, (who suffer from it), and industry (who respond to it). This led to development of **Objective 4:** *To establish the nature of sketch inhibition as a phenomenon and whether this is problematic to the design process.*

Requirement: Consider causes, symptoms, associated behaviours and attitudes to build a clear picture of the phenomenon. Players identified/those affected: educators,

¹ To avoid confusion with Turnitin, it must be pointed out that the objectives shown within this study were previously published in Thurlow & Ford (2018b).

students and industry. This led to development of **Objective 5: To explore the nature, common causal factors and effects of sketch inhibition among designers.**

Requirement: Once sketch inhibition is identified and fully described, consider methods that could be applied to reduce or prevent it. Develop tentative conceptual and practical tools for use in higher education. Need to gain feedback to support or negate benefit of such tools: would this even work? This led to development of **Objective 6: To develop a pedagogic framework for design education.**

1.4. A discipline non-specific approach

As a result of teaching students from many design disciplines it was apparent that, despite differences in output or artefact, their processes were very similar - even identical. From the outset of the study the issue of discipline was problematic; supervisors were suggesting a single approach for manageability. However, the empirical evidence observed prior to development of the research proposal – from teaching interior design, fashion & textile design and post graduate design students from various disciplines, all of whom were observed to be sketch inhibited - and data from the literature, supported the case for taking a discipline non-specific approach.

Ferguson (1992) confirmed the inherent similarities between disciplines during concept development:

“both the engineer and the artist start with a blank page...design starts with an idea – sometimes distinct, sometimes tentative – which can be thrown on the mind’s screen and observed and manipulated by the mind’s eye,”(p23).

The cognitive component of design was identified by Jonson (2005): conceptualisation being composed of a simple unit of thought, the *idea*, observed in fashion, architecture, product and graphic design among other disciplines. Similarly, Cross (2001) considered the cognitive aspects of the design process within architecture, industrial and graphic design. He noted that, *“many similarities of design cognition across domains of professional practice are found,”* (p1), and suggested the need to regard design cognition

from an interdisciplinary, domain-independent position, identifying three major generic aspects of design cognition: formulation of problems, generation of solutions, and utilisation of design process strategies.

The Across Design Project conducted by MIT and the University of Cambridge between 2002-4 considered commonalities across disciplines. Research across multi-disciplinary practices, (including jet engine design, documentary-making, food development and graphic design) identified similarity of experience:

“we observed appreciative surprise among our informants as they recognized the degree to which the experience of other professionals, who they might not have considered as natural peers, did in fact extend across design,” (Eckert et al. 2010, p30).

They identified sketching as a means to develop structure and process and to convey these to others during respective design activities:

“Designers are engaged in many of the same activities and concerns, but in very different guises according to their particular technical domains and social or business contexts,” (p38).

Gross & Do (1997) noted that *“the practice of designing has common features, regardless of the domain in which it is exercised,”* (p8), suggesting the resultant artefacts could have both physical (as with architecture and graphic design), and non-physical form, (as with dance, music and even economic plans). Crismond & Adams (2012) identified a similar paradigm, design cognition utilised within engineering, architecture, and product design. They also observed this activity within writing, biomedical design and nanotechnology, suggesting a span way beyond that of traditional design subjects. Kannengiesser & Gero (2015) most recently (and helpfully) stated that, *“designing is an act that is independent of the domain of its application, in the sense that different domains have the same understanding of this act even if they use different terms to describe it,”* (p253) concluding that: *“this may have important implications for design education,”* (p275), confirming the potential value of the study.

Based upon this evidence, and in particular that of Kannengiesser & Gero (2015) and Crismond & Adams (2012), it was considered completely safe to engage with multiple disciplines, and as such, as many disciplines were sought as practicable. The research ultimately utilised subjects from architecture, interior, fashion, contour, textile, engineering and product design.

1.5. Terminology

At this point, for clarity and consistency, it is necessary to establish a glossary of terminology appropriate to the study.

The term '*Sketch*' is considered, initially, as a two-dimensional, non-digital image-based entity created and used by the designer during design ideation. In response to the research findings, this later includes three dimensional entities able to provide the same functions.

The term '*Design Ideation*' refers to the process of identification and development of conceptual information during the design process in answer to the brief. (This specifically excludes any later visualisation process where the design has been substantiated as these are not appropriate to the study).

The term '*Sketch Inhibition*' is the inability or reluctance of an individual to engage with sketch activity (as described above), during design ideation. '*Inability*' refers to the incapacity of the individual to engage in sketch activity to a level able to support the design ideation process – this, regardless cause. '*Reluctance*' refers to the disinclination of the individual to engage in the act of sketching, regardless of the reasons for this.

1.6. A research paradox: Grounded Theory versus the PhD

During the early stages of the study, considering its aim and objectives, the lack of extant theory and available methodological paradigms, a Grounded Theory approach emerged as a potential best fit – this is fully described in *Chapter 3: The methodology*.

However, as the study progressed and research area grew, so did the conflict between said Grounded Theory and institutional requirements for a PhD.

The need for a detailed methodology to be submitted at formal review stage – twelve months into the study and prior to any primary research being undertaken – actually prevented a *true* Grounded Theory approach being taken. However, the likelihood of such a proposal passing formal review using this approach was non-existent, so modifications had to be made in acknowledgment of this.

The requirement for the presentation of “*a conventional dissertation*,” according to the Code of Practice for Research Degree Students (De Montfort University, 2018, Section 23: Presentation of Thesis, p52), was also in conflict with the chosen structure.

Although this could be interpreted rather loosely, the mandatory training modules within the doctoral training programme, specifically, *REST7301 Structuring and Completing Your Thesis (Online)*, (De Montfort University n.d.), reinforced a linear approach to thesis presentation, describing a very specific format, (see captured screenshot in figure 8, below).

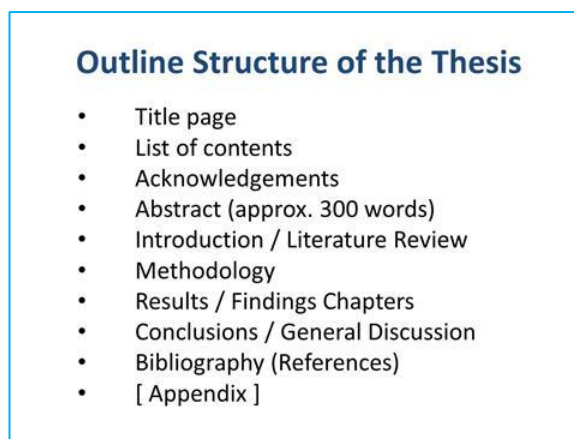


Figure 8: Required thesis structure. Source: De Montfort University, n.d.

Additional research using past PhD theses endorsed this as the standard style of presentation – there appeared to be no possibility for deviation from this structure. A

purist Grounded Theory approach would have produced a fluid thesis presented as a jumble of literature, data and analysis that through a reductive process would lead to a final theory (Suddaby 2006). The chance of this style of thesis being accepted would be unlikely, and accordingly, this thesis has been tempered: a Grounded Theory approach but with deference to the positivist requirement of PhD study. Suddaby's (2006) suggestion of using visual models to overcome the difficulties of presenting lateral research using a linear structure is implemented.

This problematic of methodology posed an interesting conundrum for the study. The intrinsic relationship between Grounded Theory and its subject matter (the latter informing the former), suggested that a study of its use could be of value. This uneasiness between research paradigm and requirement led to development of a further methodology-centric objective for consideration, Objective 7: *To what extent does the use of Grounded Theory conflict with the requirements of traditional PhD study?*

Although not considered at the outset of the study, an observation of how this conflict influenced the research was undertaken and is presented *Chapter 10: Conclusions & Final Thoughts*.

1.7. The intended contributions to new knowledge

Three individual contributions emerged as a result of this study, the first two, intentional from the outset, the third, circumstantial, as a result of objective 7.

The intention to establish an understanding of the nature, cause, effects and management of sketch inhibition among undergraduate designers and the clear absence of a specific theory of sketch inhibition presented the opportunity to develop one. This became the study's overarching purpose and its first intended contribution to original knowledge. The lack of a formalised pedagogic tool for sketch inhibition presented an additional opportunity to develop such a framework - the second intended contribution to knowledge.

In addition to this, Objective 7: *To what extent does the use of Grounded Theory conflict with the requirements of traditional PhD study?* – presents observations regarding the use of such theory for PhD study.

1.8. Navigation of the document

The study is presented in a linear format, but does not necessarily reflect the order in which the research was conducted - as already stated, models have been used where necessary to illustrate the research process.

Chapter 2: The Literature Review – this addresses the first six objectives, considering the sketch in its widest context and sketch inhibition, (where data was available). It justifies the need for investigating sketch inhibition and forms a narrative to underpin the study. For clarity, data is presented in two phases: *Phase I* refers to the sketch, its purpose functions and wider issues relevant to sketch inhibition. *Phase II* refers to the specifics of sketch inhibition, its causes, symptoms and management.

Chapter 3: The Methodology - this presents and discusses the initial methodology proposed at formal review stage together with an explanation for its complete revision. An overview of the philosophy of relevant research paradigms together with a discussion of design-specific epistemology is included. This underpins consideration of more appropriate and effective methods for data gathering and analysis, specifically phenomenology, Grounded Theory and thematic analysis.

A comparative evaluation of methodological approach is undertaken and from this, the chosen Grounded Theory approach is detailed. Despite the linear presentation of chapters, the case study, learning style survey, longitudinal study and action research using teaching & learning practice all developed as the data grew and the need for such methods emerged from it.

Chapter 4: Interviews with Educators – this chapter presents findings and discussion from semi-structured interviews conducted among higher education professionals from multiple disciplines.

Chapter 5: Interviews with Industry Influencers - this chapter presents findings and discussion from semi-structured interviews conducted among industry influencers; individuals working within the design industries responsible for the recruitment of graduate designers.

Chapter 6: Interviews with Students – presents findings and discussion from the semi-structured interviews among third year undergraduate designers from multiple disciplines.

Chapter 7: Learning Style Survey & Longitudinal Study – this presents and discusses the findings of two surveys among some of the student interview subjects. The former, to identify a possible relationship between learning style or preference and sketch inhibition, the latter, to establish the effects of sketch inhibition upon employability.

Chapter 8: Case Study: Leicester Media School Drawing Centre – this presents the findings and discussion from an in-depth semi-structured interview with Chris Wright, founder and head tutor at the school, considers taught material used within sessions, and presents feedback from students taught using his methods.

Chapter 9: Fulfilment of the Objectives – these are considered individually, findings from the research data drawn together to ultimately address the aim: *“To develop a theory of sketch inhibition leading to a pedagogic framework for design education.”* A theory of sketch inhibition and a pedagogic framework are presented, together with feedback from the action research using teaching & learning practice to test the efficacy of the framework.

Chapter 10: Conclusions & Final Thoughts – this considers the project from a methodological and practical standpoint. The additional objective: *To what extent does*

the use of Grounded Theory conflict with the requirements of traditional PhD study? is also answered in this chapter. It includes a critique of processes and, as this is an indicative study, recommendations for further enquiry and suggestions for future research output. In conclusion, a reflection of the PhD process as a whole is presented.

Chapters 4, 5 and 6 reflect findings from part of the methodology pre-defined for the formal review and kept because of its good fit with the study. Chapters 7 and 8 are as a result of the growth of methodology - the concurrent analysis and purposive sampling approach of Grounded Theory applied to the already gathered data.

The following chapter considers the literature and provides the basis from which the study grew.

Chapter 2: The Literature Review

2.1. Introduction

To reiterate, the aim of the study was: *'To develop a theory of sketch inhibition leading to a pedagogic framework for design education.'* During this initial stage, the research questions were phased for manageability and clarity of presentation:

Phase I: The first three objectives, below, were fulfilled through the extant literature.

These considered the wider, contextual issues relevant to sketch inhibition:

1. *To explore and evaluate the specific nature, scope, functions and benefits of sketching activity, the purpose it fulfils within the design process and whether it is a necessary part of contemporary design practice.*
2. *To explore the internal dialogue and processes of the designer during the design ideation process.*
3. *To establish the current position and status of sketching within contemporary design higher education alongside other concept development tools.*

Phase II: These objectives were minimally fulfilled by the very limited extant literature on sketch inhibition, (relying mainly on the later primary research):

4. *To establish the extent of sketch inhibition as a phenomenon and whether this is problematic to the design process.*
5. *To explore the nature, common causal factors and effects of sketch inhibition among designers.*
6. *To develop a pedagogic framework for design education.*

Two conference papers and two journal papers listed below (and presented in Appendix 1) were produced during the course of the study and have been used, where appropriate, within this review. These are:

Thurlow, L. and Ford, P., (2017) *Where have all the ideas gone? An anatomy of sketch inhibition among student designers*. In: Proceedings of the Design Management Academy Conference 2017 (pp. 1703-1718).

Thurlow, L. and Ford, P., (2018a) *Ideal ideation: a framework for the management of sketch inhibition among undergraduate designers*. In DS92: Proceedings of the DESIGN 2018 15th International Design Conference (pp. 2517-2528).

Thurlow, L. and Ford, P., (2018b) *An Analysis of Sketch Inhibition within Contemporary Design Education*. Universal Journal of Educational Research, Vol 6 No 9 (pp. 2036-2046).

Thurlow, L., Ford, P., Hudson G., (2018) *Skirting the sketch: an analysis of sketch inhibition within contemporary design higher education*. International Journal of Art & Design Education, Wiley.

The literature review had to fulfil two further sub-objectives not mentioned by the research proposal:

1. *Identification of the issues requiring research using primary methods, and,*
2. *Development of appropriate research methodologies to conduct such activity.*

The former will be considered within the findings at the end of the chapter, the latter, separately as part of the research methodology.

2.2. The method

The literature search began by using broad keywords. These proved problematic: the keyword 'Drawing' functioning as a verb, returning inappropriate results, and 'Sketch' returning information on disciplines other than design. Literature relating specifically to 'Sketch inhibition' appeared non-existent and this, coupled with a lack of that related to sketching during concept development, demanded a more creative approach

for generating the data. Mind-mapping techniques (based on Buzan, 1996) were applied to expand on the concept of 'Sketch inhibition' and identify gaps in the extant literature. These, (shown in figures 9 & 10 below) produced a framework of relevant subject areas that were converted into keywords (listed in Appendix 2) - the literature accessed using these keywords.



Figure 9: Mind maps created to identify gaps in knowledge during literature search. Source: the author.

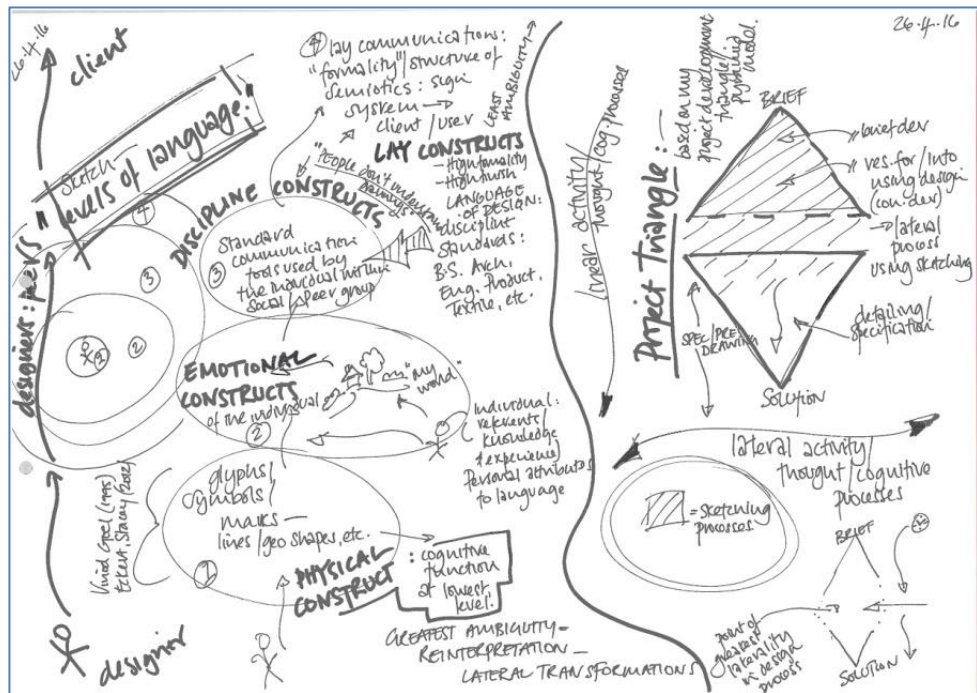


Figure 10: Mind map created to identify gaps in knowledge during literature search. Source: the author.

As familiarisation with the literature grew, citation and author searches were subsequently applied. Forward and backward citation searches were most effective: the position of sketch inhibition within a much wider literature environment has meant that work of a relatively small number of academics provided the most literature.

Databases used to date included: DMU library catalogue including Scopus, Ebsco, Design & Applied Arts Index, COPAC, Google Scholar, and the British Library EThos database. An ongoing British Library Zetoc alert was set up to identify new publications with relevant keywords and those from authors of importance to the

study. A meta-record of the literature was developed in Excel for project management purposes, as tool for analysis and for micro-management of the process.

Nvivo was utilised throughout the entire research process, but initially for the literature review for storage and management of data and for content analysis. Such analysis was undertaken using an emergent strategy, (Kara 2016) the coding process being iterative - the literature acted as the driver for identification of new issues. Meta/parent nodes were created using Nvivo, micro/child nodes developing from these where appropriate as the body of data grew.

2.3. Meta-analysis of the literature

Sources were almost entirely peer-reviewed academic journals and conference papers - publications by practitioners and academics. Use of grey literature, including web-based sources was minimal as it proved of little benefit. A vast quantity of literature was, unwittingly, accessed during the course of the study – certainly far more than was ever needed to complete a review of this size. However, reading so widely proved to be beneficial by identifying areas of potential future research.

As demonstrated by Figure 11, there was a disparity between disciplines from which the relevant literature came. Architecture and engineering provided by far the largest body of literature of relevance to the study, whereas the design crafts provided very little, illustrated by Eckert & Stacey (1998) who noted that, *“knitwear, a large commercially important design-driven industry... has been neglected by academic design studies.”* For this reason, no literature was available from this discipline to support this study. Thurlow & Ford (2018b) proffer reasons for the disparity:

“the process of architectural design involves meta-analysis and representation through scale models and drawings, whereas craft-based disciplines involve a more direct and immediate relationship with their respective materials. Architecture and engineering also require the production of conscription devices and bodies of written information in order to be realised: the tradition of academic rigour of such disciplines could offer an explanation as to their strong influence over the literature...” (p2037).

The difficulty in acquiring specific literature on sketch inhibition reflected a broader ongoing issue about the disinclination of designers to intellectualise their activities – this is discussed in *Chapter 3: The Methodology*.

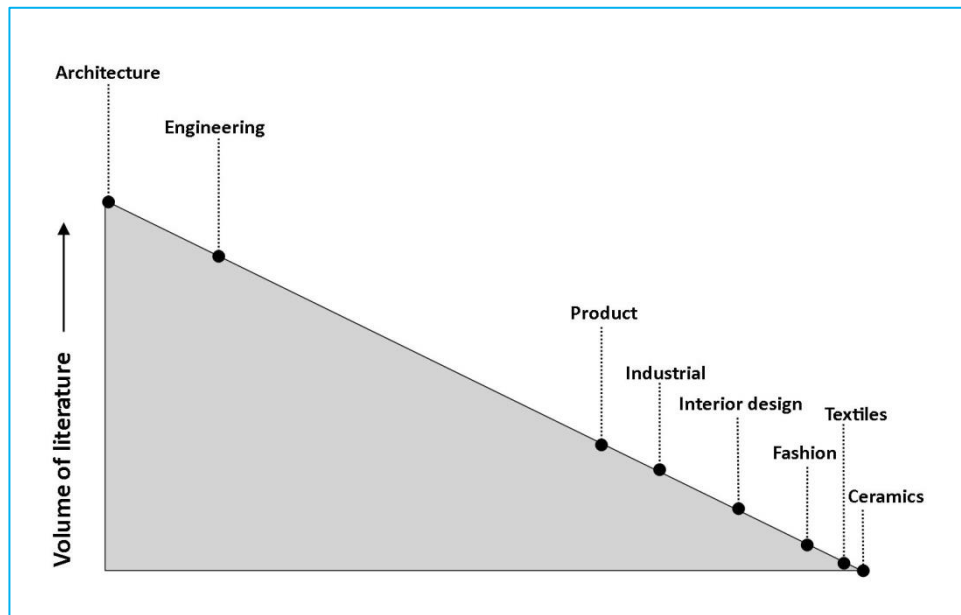


Figure 11: Volume of literature accessed according to discipline during the course of the study. Source: the author - first published in *Thurlow, L. & Ford, P, (2018b)*

The following models illustrate the meta-analysis of the literature sources. Figure 12 illustrates the number of literature sources that were assigned to individual emergent nodes. For example, fifty pieces of literature were acquired that contained data coded into the node: 'Purpose of sketching.' Figure 13 illustrates the number of codings made into each node, for example, the node: 'Research methodologies' elicited 600 individual codings. From these models, it was apparent that fewer than ten sources related to 'Sketch inhibition' and within that node, there were little more than fifty individual codings, i.e.; specific pieces of data contained within those sources referring directly to sketch inhibition.

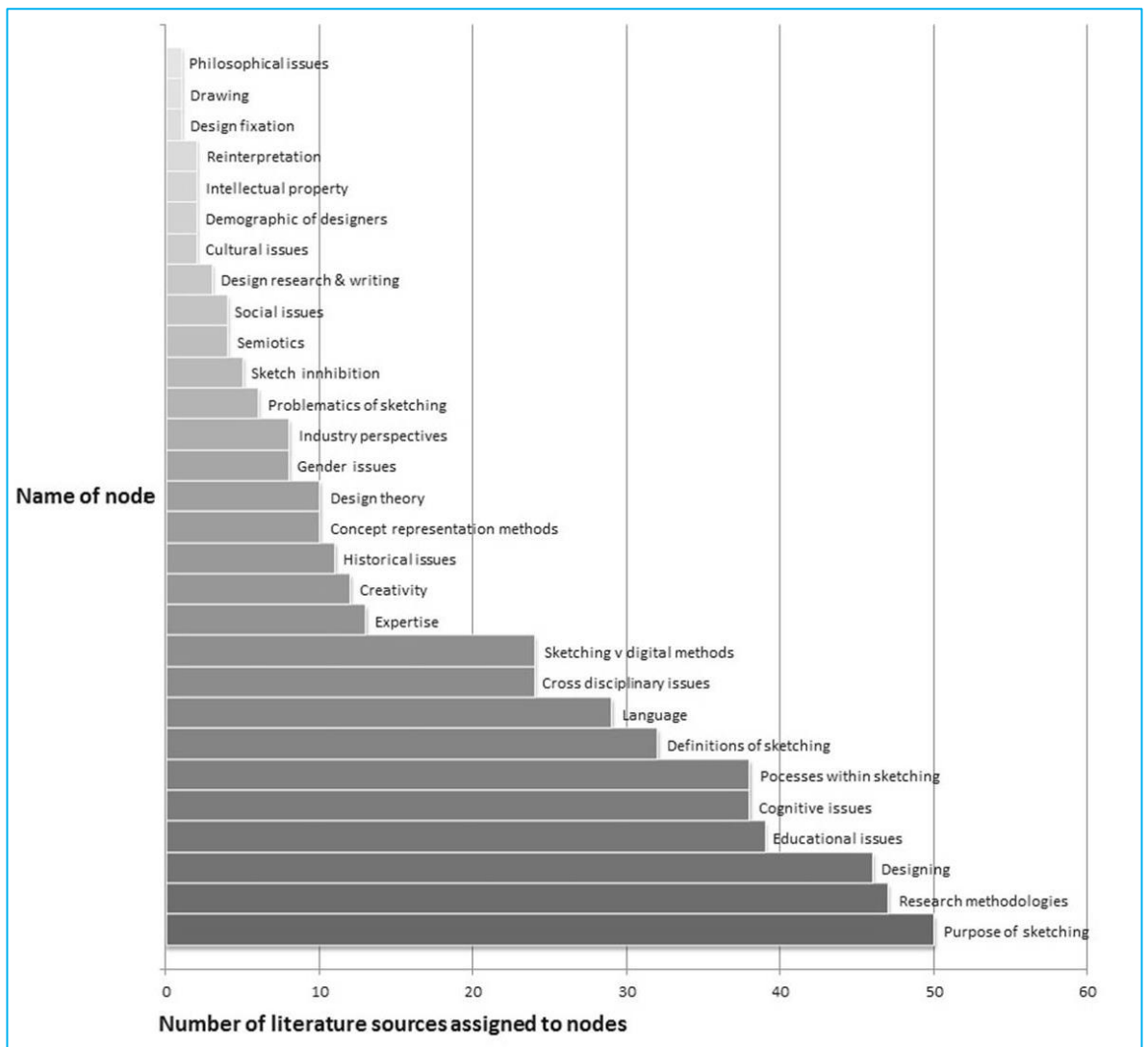


Figure 12: Illustration of the number of literature sources assigned to emerging nodes. Source: the author - first published in Thurlow, L. & Ford, P, (2018b).

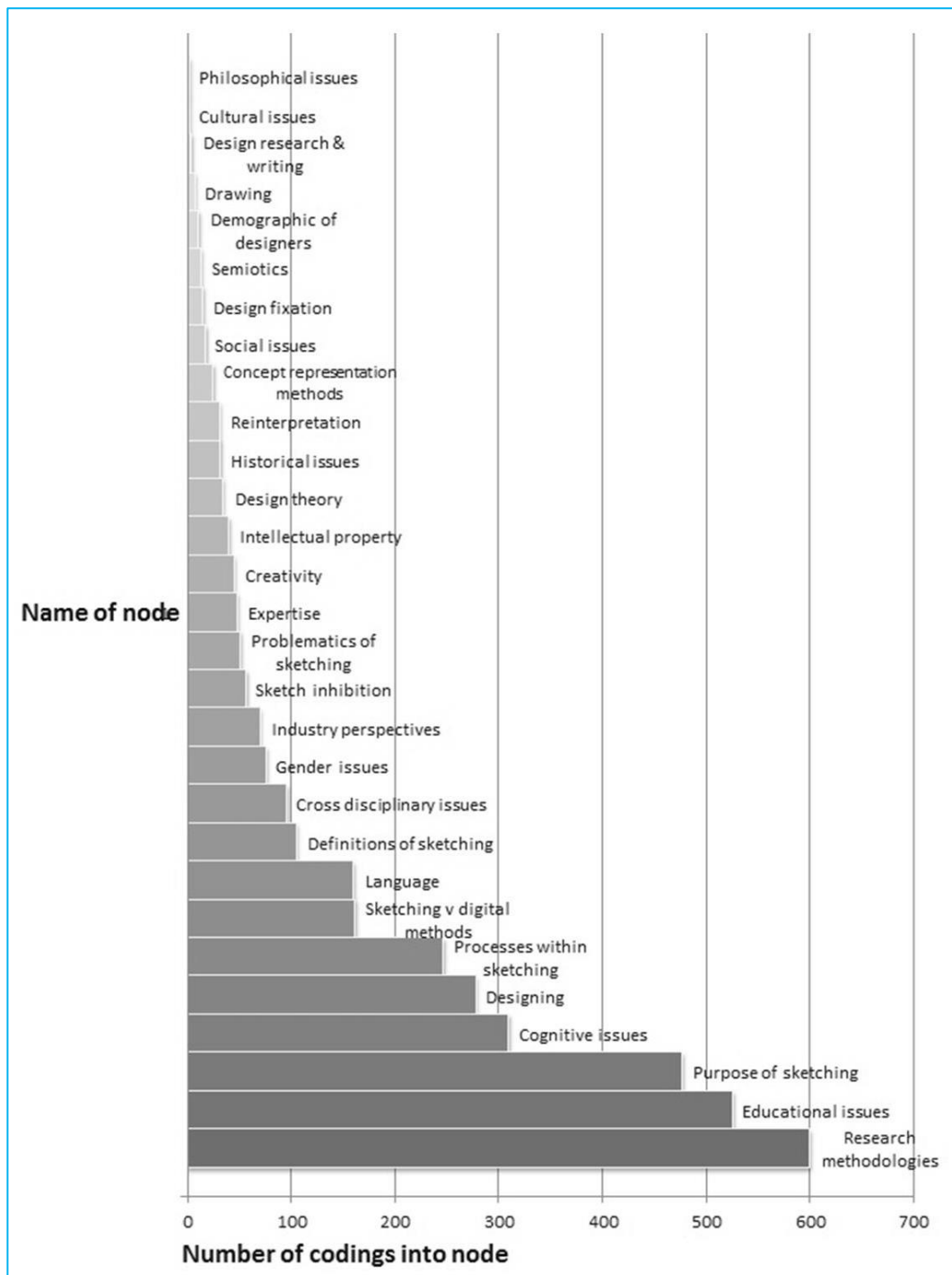


Figure 13: Illustration of the number of codings placed into emerging nodes. Source: the author - first published in *Thurlow, L. & Ford, P. (2018b)*

2.4. Findings from the literature

For clarity, findings are divided into two broad sections: *Phase I*: Sketching (objectives 1-3), and, *Phase II*: Sketch Inhibition (objectives 4-6).

2.4.1. *Phase I findings: Sketching – Objective 1*

To explore and evaluate the specific nature, scope, functions and benefits of sketching activity, the purpose it fulfils within the design process and whether it is a necessary part of contemporary design practice.

i. A definition of sketching

The terminology used for this study was problematic at the beginning. *Sketch* and *draw* were used interchangeably, with little consideration for their real meaning, so a definition was sought to avoid confusion. The term '*sketch*' comes from the Greek '*skhedios*' meaning "*done without preparation,*" (Lambert & Firth 2006). Eckert et al. (2012) described a sketch as simply, "*a series of marks on paper,*" its meaning generated from a "*combination of symbolic and geometric correspondences between sketch elements and their referent objects,*" (p250).

Scrivener (1997) described the sketch as, "*the first freehand externalisations that a designer produces,*" (p-). Fish & Scrivener (1990) identified their specific purpose within the design process as, "*images used to assist in the design of something,*" adding, "*... purely objective drawing, with no mental manipulation, would not count as sketching,*" (p120). Kavakli et al. (1998) described its typical characteristics: "*its vagueness, its incompleteness, its ambiguity,*" (p485). They also identified, "*the transition from a state where envisioned entities have no external representation to the state where they do, and where the externalisations are realised through free-hand drawing,*" (ibid) – this being via the sketch.

Booth et al. (2015) believed the sketch offered various attributes, being "*disposable, rapid, vague, subject to reinterpretation, and include only enough information to communicate*

an idea," (p1), and referred to Buxton (2007), stating *"because of these elements, sketches are often unintelligible outside the original context in which they were drawn,"*(p1).

The difference between drawing and sketching was explained by Eckert et al. (2012): *"sketch means to create a drawing on paper that depicts something in an informal way, where decisions are provisional and details approximate. Engineers reserve the word drawing for precise formal depictions with exact measurements; anything less formal is deemed a sketch,"* (p245). Atilola et al. (2016) compared it with draughting: *"A sketch requires composition without aiding instruments, such as a straight edge. This differentiates it from a line drawing which is composed of a line created by hand but with the aid of assistive instruments,"* (p113). Ullman et al. (1990) concurred, stating, *"there are two measures to consider: (a) the use of instruments and (b) whether or not the drawing was to scale,"* (p-).

Lau et al. (2009) suggested that sketches had a much broader definition; *"sketches are considered to be any visual representation of an idea, regardless of whether it was drawn by hand, photographed or digitally produced,"* (p24). Similarly, Schenk (2007) believed that, *"the role of drawing in the design process continues to develop and change"* (p13) – something the study would have to be mindful of.

With particular reference to Lau et al.'s (2009) definition of the sketch as: *"any visual representation of an idea..."* it was considered important to establish consensus as to the type of communication that could be considered as a sketch for the purpose of the study. Corremans et al. (2018) referred to experiments by Bilda & Demirkan (2003): they stated that *"traditional media have advantages over digital media regarding attention to, and reaction to visuo-spatial cues, specifically the relationship between elements in the design, and the quantity and variety in problem solving methods to address the design goals,"* (Corremans et al. 2018, p2412).

At this point in the study, the term *sketch* - a two-dimensional, non-digital entity - was established as the appropriate definition for the type of image under consideration.

ii. A history

The inclusion of a brief history of sketching within the design process was thought to be of benefit, not least as a chronological anchor, but also to observe how attitudes towards it might have changed over time. Kosslyn (1994) referred to Theaetetus (369BC) which presented Plato's early use of a wax tablet as a means to store mental imagery. This concept was used and understood as the basis for mental imagery throughout history of philosophy and by Associationists during the 18th Century - Associationism based on the individual's reliance on association for memory and learning.

Many references to Da Vinci's sketches exist in the literature. Cross (1999) observed: *"cognitive processes were assisted by drawing... the sketch can help the designer to consider many aspects at once - we see plans, elevations, details, trajectory lines, all being drawn together and thus all being thought about, reasoned about, all together,"* (p33). Gombrich (1996) quoted by Pigrum (2010, p-), stated *"da Vinci enhanced an existing drawing tradition that 'instead of fixing the flow of imagination keeps it in flux.'"* Fish & Scrivener (1990) also quoted Gombrich (1966): *"it was Leonardo da Vinci who first described and advocated the deliberate use of such untidy indeterminacies to stimulate invention, pointing out that confused things rouse the mind to new inventions,"* (p-).

Despite a clear relationship between thought and sketch, between 1913 and the 1960s, behaviourists denied the existence of mental imagery. During this time, Laseau (1937) identified among architects, a cyclical process existing between eyes, brain, hands and the sketch, but wasn't until the 1970s that Shepard and Cooper were able to demonstrate the existence of imagery, (Kosslyn 1994).

"The role of drawing changed enormously in the 20th century," according to McManus et al. (2010) who suggested that drawing was *"neither necessary nor sufficient for attainment or acclaim in art school or the art-world,"* (p18). Schenk (2005) too, identified a decline in the use of sketching over the last twenty years in the graphic design industry,

“... because of increasing computer usage... the... process was found to be supported throughout by paper-based drawings ... By the mid-nineties the majority of graphic designers made regular use of the computer in their work and some worked almost entirely within the digital environment,” (p5).

However, despite this, Schenk’s (2005) research revealed that *“during the late Nineties most creative directors interviewed were adamant that the initial stages of the design process, ‘the thinking stages,’ should be conducted outside the digital environment,” (p5).*

iii. Creativity and the sketch

Understanding the relationship between sketch ability and creativity was of value to the study: did a correlation exist, and if so, what were its characteristics? There was little specific literature in respect of this, but what did exist was useful and could be observed in the generation of concepts.

Dietrich (2007) referred to creative activity occurring in a state of defocussed attention, Eckert & Stacey (1998) discussed combining, adapting and exploring ideas and reusing chunks of data to develop ideas. Farzaneh et al. (2012) referred to generation, exploration and comparison during idea generation. However, despite these creative tools being discussed in significant detail, the means of recording them, i.e.; using the sketch went unmentioned.

Van der Lugt (2002) mentioned ‘brainsketching’ as a tool for recording ideas, but did not identify any correlation between it and creativity. Corremans et al. (2018) cited Chan & Zhao’s (2010) observation that, *“people who are good at drawing are also creative, and that drawing training in itself makes people more creative,”* (Corremans et al. 2018, p2412). Kudrowitz & Wallace (2013) noted that, *“the clarity of the sketch positively influenced ratings of idea creativity,”* (p120). Similarly, Schenk (1991) had observed that, *“fluid and confident use of drawing was essential in the simulation of ideas”* (p-).

Verstijnen et al. (1998) referred to the *“Kunzendorf test of Aesthetic Preference,”* (Kunzendorf 1982) which *“measures the mastery of ‘visual grammar’,”* (Verstijnen et al.

1998, p539):

“Creative individuals... have a better mastery of ‘visual grammar’, which improves their ability to transform and restructure knowledge... people who scored high on this test were far more likely to find a novel part if they had spontaneously sketched, than the low scorers,” (Verstijnen et al. 1998, p539).

They referred to the development of new ideas: *“when mental images are projected in sketches, new structures can be seen in the sketches which could not be obtained from the mental images before the projection,”* (p532), the connection between creativity and the sketch in no doubt.

iv. The sketch and its relationship to design

The relationship between design and the sketch was important to establish. Until this point, this was based on a combination of assumption and empirical evidence: was sketching even a necessary part of the design process?

There was acknowledgement of the volume of information handled by the designer: *“design is a very complex activity, which is both knowledge and process intensive,”* (Davies 1995, p112). *“Information processing and decision making is very intensive in the conceptual design phase, as a consequence of generating and evaluating alternative ideas,”* (Demirkan 2016).

The nature of the design problem was also of interest: Goel and Pirolli (1992) identified several distinctions which distinguished it from other types of problem. Cross (1999) suggested that,

“design is opportunistic... abductive: a type of reasoning different from the more familiar concepts of inductive and deductive reasoning, ...” (p30) *“exploratory... the creative designer interprets the design brief... as a kind of partial map of unknown territory,”* (p29) *“design is emergent... having properties that suggest how the developing solution-concept might be matched to the developing problem-concept,”* (p29), and *“ambiguous,”* (p31).

The need for a method of information handling was evident. Cross (1999):

“the ill-defined nature of design problems means that they cannot be solved simply by collecting and synthesizing information...” (p29)...“what you need to know about the problem only becomes apparent as you’re trying to solve it,” (p30).

Problem framing appeared as a distinct feature of the early part of the design process. *“Designing involves ‘finding’ appropriate problems, as well as ‘solving’ them, and includes substantial activity in problem structuring and formulating, rather than merely accepting the ‘problem as given’,” (Cross 2001, p81).* According to experiments by Thomas & Carroll (1979), *“Designers’ behaviour was characterised by their treating the given problems as though they were ill-defined,” (from Cross 2001, p82).* Lawson (1979) compared the approaches to problem-solving of designers and non-designers, observing that the latter, *“attempt to define or understand the problem fully before making solution attempts,” (from Cross 2001, p83).* Using architects and scientists, he discovered that,

“scientists... discover the structure of the problem (with) a problem-focusing strategy... architects by contrast adopted a solution-focusing strategy... generating a sequence of high-scoring solutions until one proved acceptable... Many studies suggest that designers move rapidly to early solution conjectures, and use these conjectures as a way of exploring and defining problem-and-solution together,” (ibid).

Goel & Pirolli (1992) also advocated *“initial explorations of a problem by posing a number of possible solutions,” (from Crismond & Adams, 2012, p750), or, “problem structuring through solution attempts,” (Cross 1999, p35).*

With regard to idea generation, Akin and Lin (1995) identified three modes of ideation activity: *“drawing, examining and thinking,”* and in particular, *“overlap... of the designer’s attention from one segment to another (as) single, dual or triple-mode periods,” (from Cross 2001, p93).* They identified an increased occurrence of NDDs, (novel design decisions) during the triple-mode activity: *“six out of a total of eight times a novel design decision was made, we found the subject alternating between examining-drawing-thinking in rapid succession,” (ibid),* endorsing the notion that successful ideation requires management of much complex information.

According to Brun et al. (2015), *“modelling the alternation between knowledge and concepts*

allows (for) differentiating several types of design strategies," (p4). They describe,

"breadth-first strategies, which consist in exploring various paths from the original concept... allows reaching originality but is very costly in terms of knowledge... and "depth-first strategies," which consist in focusing on a single path," (Hatchuel, et al. 2004, in Brun et al. 2015, p4).

Ball & Ormerod (1995) describe this as a structured approach versus opportunism, suggesting the novice is more inclined towards a depth-first approach to design, exploring issues in a linear sequence. Experienced designers handle information differently, using both depth- and breadth-first strategies: *"a flexible mixture of modes is a more psychologically realistic control structure for expert design,"* (from Cross 2001, p94).

The benefits of the sketch appear numerous, notably, *"freehand sketching improves the quality and novelty of ideas,"* (Mckoy et al. 2001, Hernandez et al. 2012, from Booth et al. 2015, p2). It acts as a waypoint and control mechanism: *"the sketch stands for a passing stage of the design process, it stops that process and makes the designer examine... what has been done, and in what direction... work must proceed,"* (Arnheim 1993, p17).

The ability of the sketch to mitigate the effects of other, less successful, communication tools was of interest: *"visual representations... show multidirectional connections that linear verbal descriptions could obscure... (and) help develop ideas faster,"*(Brown 2009, p4). They also appeared to enable the navigation complex of design data:

"sketches enable designers to handle different levels of abstraction simultaneously... designers think about the overall concept and at the same time think about detailed aspects of the implementation of that concept... designing is not a strictly hierarchical process; in the early stages of design, the designer moves freely between different levels of detail," (Cross 1999, p34).

The requirement for sketching during the design process appeared doubtless - a clear interdependency existing between the handling of large quantities of complex information and production of sketches during the design process. The functions of this are considered more closely by the next objective, specifically the findings relating

to cognitive activity.

v. *The functions of the sketch*

The findings suggest the sketch fulfils many functions within design ideation, but these tend to be imprecise and often overlap. Brun et al. (2015) noted this: “*a talking sketch... can be used to talk, but also to think or to convince. In the same way, idea generation is not to be associated only with thinking sketches but can also occur while working with talking or prescriptive sketches,*” (p2). Eckert et al. (2012) maintained that, although the sketch can “*range from the formal to informal for different contexts, domains, and uses... most sketches are intended for a particular audience,* (p245). As such, it was considered necessary to identify a taxonomy and distinguish individual functions as best as possible.

Ashwin (1984) identified several types of sketch relevant to design ideation: the “*referential*” sketch, representing a concept in a clear, factual manner. The “*phatic*” sketch encouraged discourse with the receiver, (ideal for the growth of concepts) and the “*metalinguistic*” sketch included information about how to read the drawing it appears on, for example, a key or legend, (ideal for the communication of concepts). The “*conative*” sketch could be likened to that of Eckert et al.'s (2012) conscription device, persuading the receiver to act in a certain manner, as could the “*emotive*” sketch that attempts to evoke a particular subjective feeling or response from the receiver.

Ferguson (1992) offered an early taxonomy consisting of three types of sketch: “*thinking sketches*”... *for new ideas*, “*talking sketches*”, *made (to) communicate*, and “*prescriptive sketches*”... *to please and convince people outside of the design process,*” (from Brun et al. 2015, p2). Eckert et al. (2012) elaborated: “*thinking sketches... support individual thinking processes; talking sketches... support group interaction; and prescriptive sketches... express decisions... (and) storing sketches, drawn to retain ideas,*” (p246). Olofsson & Sjöblén (2005) categorised sketches into *investigative* for problem definition, *explorative* for generating and considering concepts, *explanatory* to communicate concepts, and *persuasive*, to promote concepts. Pei et al. (2011), more recently, developed a more advanced

taxonomy relating to visual design representations, identifying nine types of sketch - see figure 14.

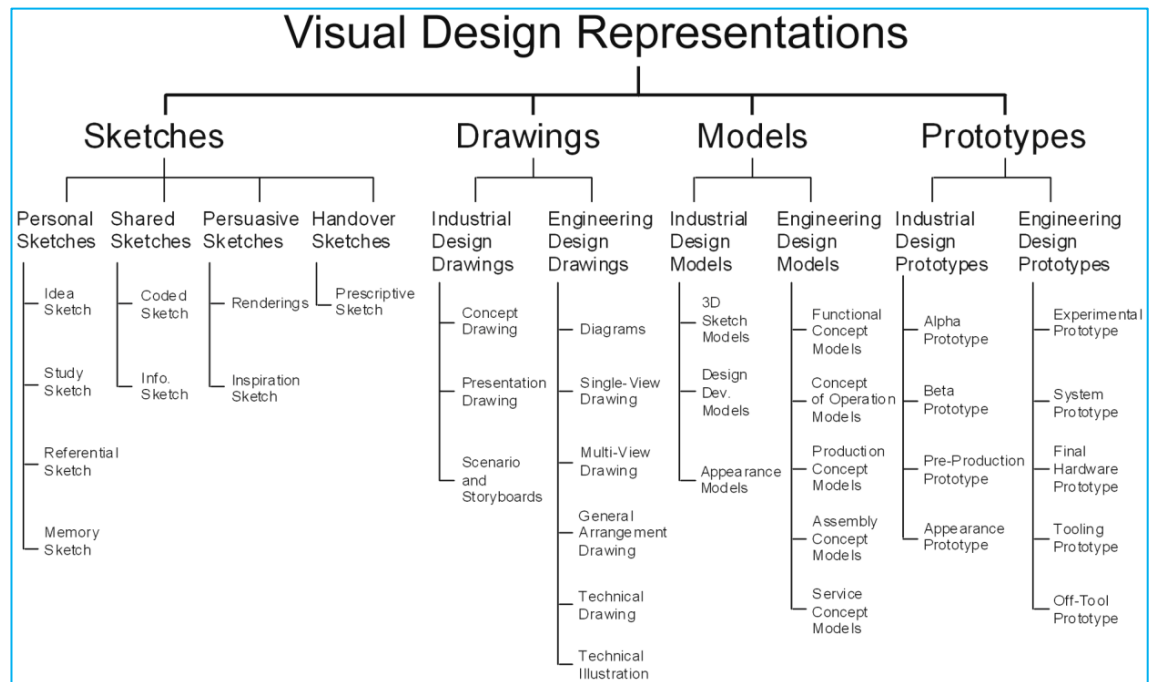


Figure 14: Taxonomy of visual design representations. Source: Pei et al, 2011

Although interesting, Pei et al.'s (2011) taxonomy failed to describe the specific functions of the sketch, so further literature was sought. As a result, idea generation was identified as a primary function. In *“the interaction between concepts and knowledge,”* it was important, *“to understand the generative effects of sketches,”* (Brun et al. 2015, p4). These were, *“essential for the emergence of ideas,”* (Goldschmidt 1991, from Brun et al. 2015, p2), and *“most important for ideation,”* (Linsey et al. 2011, Mckoy et al. 2001, from Booth et al. 2015, p2).

Knowledge representation was a vital function of the sketch: *“it allows to externalize ideas and information, therefore enhancing memory and thought”* (Goel 1995, Suwa & Tversky 1997, Tversky 1999, from Brun et al. 2015, p2). *“Even with a decline in the use of sketching... (it) offers several advantages over other representations,”* (Westmoreland et al. 2011 from Atilola et al. 2016, p113). *“They not only supply the designer with tangible images*

of what his or her mind is trying out in the dimness of its own freedom, but they also permit the observer or theorist to catch a few stop-motion glimpses of the flow of creation,” (Arnheim 1993, p19). *“Sketches incorporate... drawings of tentative solution concepts but also numbers, symbols and texts, as the designer relates what he knows of the design problem to what is emerging as a solution,”* (Cross 1999, p35), the sketch acting as an *“intelligence amplifier, just as writing is an intelligence... Without writing, it can be difficult to explore and resolve our own thoughts; without drawing, it is difficult for designers to explore and resolve their thoughts,”* (Cross 1999, p35). Additionally, representation through sketching is *“economical, simple, and easy to correct and revise,”* (Jonson 2002 from Atilola et al. 2016, p113-114).

During the design ideation process, the sketch appears to function as a tool for reflection – enabling the designer to make judgment about the benefit, or otherwise, of activity up to that point. Tversky et al. (2003) observed that the sketch presents back to the designer his thoughts, freeing mental load and enabling him to be evaluative. *“Sketching offers an instant feedback,”* according to Schön and Wiggins (1992, from Brun et al. 2015, p3). *“The designer is also able to obtain immediate visual and kinaesthetic feedback from a sketch,”* (Atilola et al. 2016, p114). Schon (1991), described this as a, *‘reflective conversation with the materials of a situation’* (p8). Cross (1999) described this as, *“unintended consequences... that keep the exploration going (that are) characteristic of design thinking,”* (p35).

Reinterpretation appeared to be a common benefit of sketch use: *“new ideas come not only from the designer’s mind but also from sketches themselves,”* (Brun et al. 2015, p2). Most of the data came from studies with product, graphic and architectural designers but applies to all disciplines where sketch use exists, Goel (1995) and Goldschmidt (1991, 2003) presenting much of this. Van der Lugt (2002, 2003, 2005) confirmed that *“sketching can foster reinterpretation during the individual thinking process ... or could even support reinterpretation of someone else’s drawings,”* (from Brun et al. (2015, p3). Eckert et al. (2012) also identified the benefit of sketches during joint design activities, enabling individuals to reinterpret each other’s marks. Purcell & Gero (1998) believed this

encouraged creativity, offering new ways of seeing potential and driving further concept generation.

Goel (1995) claimed the dense and ambiguous nature of the sketch enabled designers to identify new ideas and information in his work. *“Designers see more in their sketches than they put in when they draw them, and these insights drive further designing,”* (Eckert et al. 2012, p246). Atilola et al. (2016) confirmed that, *“ambiguity in design sketches can be a source of creativity since sketches allow designers to re-perceive and re-interpret figures or images,”* (p114).

Communication through the sketch was required for effective decision-making, for both designer and client: *“sketches play an important part in the selection of design concepts, and designers preselect their sketches so as to guide their customers to the designs that they favour,”* (Eckert et al. 2012, p260). As conscription devices, in the client/designer relationship, the sketch *“can be carefully constructed both to indicate commitment to a specific idea and a sense of precision, while also suggesting a controlled degree of vagueness,”* (Eckert et al. 2012, p246).

The sketch, as part of wider designer communication - Eckert et al. (2012) cite Minneman (1991) and Neilson & Lee (1994) - benefits from other modes of communication as support: *“designers use a combination of sketches, verbal information and gesture in combination, using each mode to explain and disambiguate the others,”* (p246). Booth et al. (2015) concurred with this, it being most successful in communicating when used with other tools: *“sketching is most effective when paired with other forms of communication, such as annotations, verbal communication, or hand gestures,”* (p2).

The spontaneity of the sketch was considered, its speed of production a crucial factor in ideation: *“sketches are often done very rapidly and not worked out in detail,”* (Eckert et al. 2012, p254). *“Sketching increases exploration speed”* (Brun et al. 2015 p3) and *“offers an instant feedback to the designer, who can very quickly evaluate and modify his ideas”* (Schön

1992 Goldschmidt 2003, from Brun et al. 2015, p2). Although produced quickly, as part of the designer's internal dialogue, it can still generate very specific information:

"my drawing is very quick and spontaneous and for my own reference... demonstrating the capacity of drawings for accurate communication... (and) capable of expressing form, detail, scale, or other information quite readily," (Garner 1992, p99).

Studies by Van der Lugt (2002, 2003, 2005) endorsed the impact of the sketch as a tool for idea generation during group interactions. Eckert et al. (2012) referred to sketches as, *"informal in their information content (and) can play important roles in structuring collaborative designing by teams,"* (p245). In homogenous group situations,

"sketching is often carried out in team activities, where a group of designers expresses, shares, and explores ideas... members of a professional community... share knowledge of diagramming conventions as well as sets of concepts and thinking skills," (from Eckert et al. 2012, p246).

This also applied to groups - multi-disciplinary or client/designer collaborations - illustrating Star & Griesemer's (1989) concept of the boundary object: *"artefacts that convey information between people with different expertise, who may not fully appreciate the implications the information has for the others,"* (p246).

vi. Quality of sketches

This issue was little mentioned, but did provide the study with some very insightful data. According to Corremans et al. (2018) *"good sketch quality has a positive impact on the quality of design outcomes,"* (p2418). Their earlier research suggested, *"the presentation of the idea may also affect the perceived creativity,"* (Corremans & Coppieters, 2017, p1) and proffered a very human reason for this: *"we simply prefer and value things that are aesthetically pleasing,"* (p2).

They traced this preference back through the design process: *"if aesthetics affect the evaluation of the final product or prototype, it is reasonable to assume that... ideas sketched with higher quality will be perceived as the more creative ones,"* (Corremans et al, 2018, p2413). This quality was defined as, *"...mastery in line-work execution, correctness of*

perspective, and appropriateness or realism of proportions,” (Corremans & Coppieters 2017, p2).

Corremans et al. (2018) noted another benefit: *“high quality sketches... need less interpretation to be understood, so the person looking at the sketch can focus on analysing the creativity of the idea itself, rather than attempting to interpret the sketch in a meaningful way,”* (p2412). They suggested that *“a design idea presented by a high quality sketch is more likely to be ranked as the most creative idea when compared to a sketch of the same idea drawn with lower quality,”* (p2412) (from Kudrowitz & Wallace 2013).

Within education, it was also noted that *“students with better sketch competences are more likely to score higher for their product design projects,”* (Corremans et al. 2018, p2411). They noted, *“students with a good and excellent sketch quality are overall assessed for their product design projects with higher grades than students with minimal and adequate sketch qualities,”* (p2417). Mulder-Nijkamp & Eggink (2016) also established a clear correlation between drawing quality and success of design outcomes. There was, however, a warning about sketch quality: *“there always might be a risk that the quality of the sketch overpowers the quality of the idea,”* p2413).

vii. Expertise

The information-handling ability of novice and experienced designers was considered. Cross et al. (1994) described the successful group as able to process and present design information more quickly than the novice group, for whom *‘gathering data was sometimes just a substitute activity for actually doing any design work,’* (from Cross 2001, p83) – a problem often seen in HE studio situations. He, *“segmented the students’ activities into the three modes of gathering information, sketching and reflecting... the more successful students were those who showed evidence of rapid alternation between the activity modes,”* (Cross 2001, p93). According to Schenk (2013), *“experienced designers who understand the potential of drawing and demonstrate competency in its use know themselves to be advantaged,”* (p18). The importance of maintenance of skill was cited: *“regular*

drawing, including attending drawing classes, was an important part of maintaining... visual literacy,"(Schenk 2007a, p4).

Verstijnen et al. (1998) identified that restructuring and combining were essential components of creativity and closely influenced by sketching ability. They observed that novice designers performed less efficiently in experiments observing restructuring activity during ideation, whereas expert sketchers fared much better. Additionally, using the Kunzendorf Test of Aesthetic Preference to establish individuals' mastery of visual grammar, they observed that those who sketched spontaneously performed better than those who didn't.

Experiments with architects by Suwa & Tversky (1997) and Tversky (2002), observed similar results. When considering dependency chunks within the ideation process, (where the flow of ideas was connected to, as opposed to separate from, a previous thought), they were able to confirm that experts *"have many more dependency chunks than students... they think more deeply about the topic... We believe it occurs because architects are able to 'read-off' more different types of information from their sketches,"* (Suwa & Tversky 1997, p395).

viii. Problematics of sketching

So far, the effects of sketching on design ideation seem to be largely positive – but shortcomings do exist and these are considered. Schembri et al. (2016) observed that, *"although sketches helped to overcome the language barriers... shared sketches were often not clear enough,"* (p23). This also was addressed by Eckert et al. (2012) *"ambiguity and imprecision are displayed to various degrees across many forms of sketching, leaving sketches open to varying interpretation,"*(p252). This was because,

"designers draw their mental concepts with varying degrees of accuracy according to their own conventions, but the sketches are interpreted according to the viewer's conventions as a different space of possible designs... the viewer does not know the creator's intentions; and the viewer does not viewer does not share the creator's context," (Stacey et al. 1999, p-).

Eckert et al. (2012) described problems caused by, *“divergent understanding of the formality of both the role and the content of the technical sketches,”* (p247), *“the apparently approximate having clear and precise meanings and the apparently precise being approximate and provisional. Some designers navigate these subtleties with impressive aplomb,”* (p245), their *“inherent ambiguity... often causes miscommunication and wasteful iteration in design processes,”* (p247).

The indexical properties of the sketch affected interpretation:

“The degree of apparent roughness in the sketch is a powerful signal of how wide the interpretation space should be... recipients might not easily distinguish between intentional roughness and poor drawing. This is especially the case for nonexperts... consulted at early design stages on design intentions that are represented by designers,” (Eckert et al. 2012, p252).

Stacey et al. (1999) observed that sketches could contain specific representational information, and others, more ambiguous or place holding information. As a result, *“recipients often cannot distinguish between purely symbolic representations of abstract design concepts, and sketches showing intended shapes... because the graphic notations for both produce very similar marks on paper,”* (Ibid, p-).

2.4.2. Phase I findings: Sketching – Objective 2

To explore the internal dialogue and processes of the designer during the design ideation process.

i. The sketch as a language

At its most fundamental, *“drawing for design is deeply involved in the creation and interpretation of signs as symbols,”* (Ashwin 1984, p 44). Cuff (1980) referred to *“three distinguishable, yet interdependent and interactive systems that are tacitly at work in all design drawings: representation, communication, and visual appeal,”* (p9). These functions were of primary interest and according to Cuff (1980), there exist *“parallels between verbal*

language and... visual language... a certain set of marks on a field can play back into one's mind and consequently bring forth further elaboration," (p6).

Ashwin (1984) described verbal communication as a *discursive* system, pictorial communication as *presentational*. In both instances, *"the process requires two participants, an emitter and a receiver."* (p43). He described the difference in the way the two systems were understood:

"in verbal language, individual signs (words) are combined in a linear sequence that permits analysis in terms of both the meaning of each sign and its position within the syntax of the sequence... Pictorial communication usually presents interpreters with manifold ensembles of signs rather than sequences, and the interpreters must make their own order of the presentation," (Ashwin 1984, p52).

Fish & Scrivener (1990) described how pictorial systems functioned:

"sketches use abbreviated two dimensional sign systems to represent three-dimensional visual experience... in two ways. First, lines used in drawing have a variety of descriptive meanings. Second, sketches are depictive... they provoke visual experience resembling that associated with the object... represented," (p118).

Plimmer & Apperley (2002) observed that *"the range of symbols that is used in sketches and diagrams is generally quite small: rectangles and ovals of different dimensions and orientation, straight, curved and squiggly lines," (p10).* These constitute *glyphs*: *"a single symbol or a combination of symbols... each discipline developing a unique set of meaningful glyphs," (ibid).*

Fish & Scrivener (1990) and van der Lugt (2005) described the sketch as *depictive* language: *"depictive representations refer to specific objects, rather than classes of information... These symbol systems are concrete and spatially specific... For instance, a picture of a rocking chair contains the topological information of that object," (van der Lugt 2005, p105).* Tversky (2002) identified similarities between the sketch, (depiction) and spoken language, (description) at two levels - *"at an abstract level, in the very existence of segmentation and combination, and at the level of content of a particular domain," (p151):* the sketch can be *"segmented into a small number of elements that can be combined to form an*

infinite number of drawings, (this) is similar to... language," (Tversky 1999, p4)

Tversky (2002), noted a particular benefit of the sketch: *"expressing ideas in a visuospatial medium makes comprehension and inference easier than in a more abstract medium such as language,"* (p148). Additionally, the sketch could offer:

"some of the structure of spoken language... sketches convey figural and relational properties directly, facilitating memory, inference, and discovery... Unseen information, such as motion, can also be inferred from sketches," (p150).

This is noted by Lambert & Firth (2006), but in a much wider context: *"the sketch can transcend language in terms of the ability to convey relatively complex ideas quickly....sketching is an international language,"* (p2).

Barthes (1967) structuralist approach to the study of language, (and based on the earlier work of Saussure and Pierce), like empiricism, relied upon humans defining and understanding the world via the senses: *"the way we interpret the world and the characteristics we bestow upon it are ordered or structured by the way we interpret incoming data,"* (Howell 2013, p101). He defined the *idiolect*, a language personal to the individual, rather than that used to communicate with others – this related to the pictorial system used by the designer during ideation. He also identified the *plane of content*, defined as abstract information related to concepts (the idea), and the *plane of expression* - the method of realising conceptual information, (the sketch). The combination of these resulted in the *relationship between places*, or in terms of design activity, the designer's plane of reference, being composed of the language of the discipline, personal experience, and the effects of Gestaltising.

The signs utilised by pictorial systems (i.e.; the sketch), are typical of *all* sign systems. These are based upon *denotation*, the most apparent and readily understood meaning, and *connotation*: the meaning a sign may have for an individual – which can be highly subjective, (Ashwin 1984). Ashwin (1984) cited the work of Peirce (1903), positing a trichotomy of sign – all of which can be observed within the sketch: an *"index,"* the sign being a result of the entity it signifies, the *"icon,"* where the sign resembles the entity it

signifies, and the “*symbol*,” where the sign bears no relationship to the entity it signifies, but is related to it according to a set of agreed rules. An additional, “*indexical quality*,” of the sketch was also considered by Ashwin (1984) - where marks and shapes created by the designer’s motor activity are evident in a pictorial image: “*in the most deliberate and controlled drawings there subsists an indexical element that cannot be explained in iconic or symbolic terms*,” (p45).

Considering the interpretation of signs within the sketch, Ashwin (1984) identified three levels of meaning. He described a “*monosemic*” system, the sign understood to have only one meaning. A “*polysemic*” system offered more than one possible meaning, and the “*pansemic*” system provided an unlimited number of possibilities for interpretation; the sketch, capable of conveying signs from any one of these systems.

ii. Micro-processes of sketching

In order to understand how the sketch supported ideation, an appreciation of the micro-processes involved in their production was considered necessary. Goldschmidt (1991) identified two types of proposition involving the sketch calling these “*the dialectics of sketching*,” - design reasoning being “*characterised by the designers’ oscillation between two modes of thought*,” (Stacey et al. 1999, p-). These modes were identified as *seeing that*: utilising reflective criticism of sketch imagery, and *seeing as*: involving reinterpretation of sketch imagery to provoke creativity, (Cross 2001)

Various think-aloud protocol experiments were found in the literature to describe the micro-processes of ideation. Goldschmidt (1983) stated that there were two possible routes for the progression of design ideation:

“a chain of design moves translates the data into design decisions... rational, linear deductive steps,” or, “intuitive, inductive steps that cross-cut through the given body of information... These iterative processes continue in a self-correcting, trial and error manner until all the demands are satisfied and the conflicts are sifted out,” (p8).

Suwa et al. (1998) analysed designers' descriptions during sketch activity. From this, they developed a four-part protocol, categorising *physical*, *perceptual*, *functional* and *conceptual* activity. The sketch was an inherent part of all of these: being created within the *physical* protocol, (that of mark-making), and reflected upon within the other three – the physical form of the sketch apprehended different purposes.

Schön (1992) described the ideation process as one of “*seeing - moving - seeing*,” (p5), the sketch required for a “*systematic exchange between conceptual and figural arguments*,” (Goldschmidt 1994, p158) to do so. Goldschmidt (2014) identified a combination of moves: “*brief acts of thinking lasting around seven seconds*,” (p47) and their constituent arguments. A move was described as, “*a step in the process that changes the situation*,” (p42), the *argument*, a smaller element of cognitive activity; a single decision or thought. Multiples of such arguments would enable a move - these never existing autonomously: “*they form continuums of various lengths in which they are interrelated or linked. The pattern of links is neither known in advance or fixed in any way, but it can be established empirically for each sequence of moves*,” (p47).

Goel's (1995) research using the sketches of graphic designers identified design moves within a vertical/lateral transformation context: the sketch being reflective of both these processes. *Lateral transformations* involved the shift to a new conceptual alternative, leaving previous considerations to one side. *Vertical transformations* were evident when a single concept was developed, the evidence of this being a serial set of visual elements as it progressed. According to (Cross 2001), Goel, “*referred especially to the ambiguity inherent in sketches, and identified this as a positive feature of the sketch as a design tool*,” (p90).

The ability of the sketch to support complex mind functions was evident. “*It enables and promotes the kinds of thinking that are relevant to the particular cognitive tasks... the exploratory, opportunistic and reflective nature of design thinking*,” (Cross 1999, p35), “*helps designers handle different levels of abstraction*,” (p34). To, “*think through problems*,” (Buxton 2010, Cross 1999), “*understand ill-defined problems*,” (Cross 1989) and “*extend short-term*

memory for problem-solving,” (Schutze et al. 2003, Ullman 2003) were also identified, (all from Booth et al. 2015, p1). Brun et al. (2015) confirmed that *“sketching... constitutes an important cognitive tool. In particular, it improves memory and thought and allows processing very quickly visual and spatial information,”* (p3).

iii. Cognitive issues

The cognitive benefits of sketching during ideation proved one of the most plentiful and useful areas of data for the study. Scrivener et al. (2000) and Fish & Scrivener (1990) observed sketching and cognition to be inseparable - mental imagery and perception both key cognitive activities during ideation. Cross (1999) too, observed that centric to design activity were mental processes and their externalisation via the sketch. According to Fish & Scrivener (1990), *“we recognise overall shape before constituent parts,”* the mind storing visual information, *“as a top-down hierarchy passing from general shape to the relationships between parts down to the detailed features of individual parts,”* (p121).

The field of mental imagery, according to Fish & Scrivener (1990) is structured the same as the physical field of vision - both physical and mental planes demonstrating high-resolution imagery at the centre of vision, declining towards the periphery. Kosslyn (1994) described this as a *“visual buffer (that) supports images derived from the eyes during perception, and from both the eyes and the long term memory during idea generation and manipulation,”* (from Ullman et al. 1990, p269).

Bilda & Gero (2005) described the mind as a multifunctioning platform; a *“workspace... to provide coordination of visual, spatial and verbal information and retrieval from long term memory with a central executive,”* (p146). Hu et al. (2015) refer to the physiology of creativity:

“much of the brain activity during a creative task is centered in the right-hemisphere of the brain... procedures known to increase right-hemisphere activation can also facilitate creativity... the level of creativity is related to the level of psychological arousal, with lower arousal being associated with higher creativity. Defocused attention is also a

feature of creative thought... hypnosis, music, (are) activities that induce right-brained thinking," (p2).

iv. Types of memory

Bilda & Gero (2005) state that, *"working memory in design has been emphasized as a workspace for cognitive processes that retains information in visuo-spatial or verbal modes since designing involves the use of both verbally coded and visually coded knowledge," (p146).*

According to Ullman et al. (1990), *"there are two locations corresponding to the two different kinds of memory: short-term memory (STM) and long-term memory (LTM). There is also a "processor" that is responsible for applying operators and controlling the design process," (p269).* They recognised a trade-off between speed and capacity of STM and LTM:

"short-term memory is very fast and powerful... All design operations... are made on information that is brought into short-term memory... Although limited in capacity, the STM is a fast processor with processing times in the order of 100 msec," (p270) - Miller (1956) suggested the STM can hold just seven pieces of information at any time. By contrast,

"the long-term memory... has essentially infinite capacity, but access is slow (from 2 to 10 seconds per chunk)... During design, parts of the design state are stored in long-term memory. These are relatively easy to cue because, at any time, currently important parts of the design state are in short-term memory and can act as pointers," (Ullman et al. 1990, p270).

According to Kosslyn (1994), the LTM can contain two types of information structures: *image files* and *propositional files*: the former representing the basic shape of any given structure, the latter offering details about that structure and their relationship in three-dimensional space. Such structure types are closely associated and transformed within mental imagery via specific cognitive actions, (an example being, *zoom, rotate, scan*), (from Kavakli et al. 1998).

Ullman et al. (1990) posited that a design concept can only exist in LTM, STM or an external memory, each of these offering different benefits during the process of development. They make the case for the sketch:

“the short term memory forms a critical bottleneck for human designers... as the STM transforms information so rapidly and the long term memory so slowly... external representations made through transforming the image to graphic or textual representation can serve as added memory,” (p271).

v. Mental imagery

Fish & Scrivener (1990) stated that a most basic cognitive ability is that of combining perceptual structures from memory with features from external percepts to create a single image. Bilda & Gero (2005) referred to such imagery as the visuo-spatial sketchpad (VSSP). Kosslyn (1994, 1996) identified two types of mental representation: the *propositional representation* - a verbal description or instruction whereby the subject creates their own imagery and the *depictive representation* - an entity with a configuration in a spatial context, e.g., the sketch, or imagery. He also demonstrated that the area of the brain that deals with visual perception is the same as that which handles mental imagery. This parallel between mental and real world processes was also noted by Tversky (1999) who stated: *“constructing a complex geometric figure is similar to mentally drawing one... mental transformations... are unconstrained in order, they are performed in a stereotypic order. That order follows the constrained order of drawing,”* (p4).

The nature of mental imagery was of interest. According to Arnheim (1993), *“all abstract thinking relies on some perceptual referent; even the most abstract theme is tied from the beginning to concrete images. These images supply the designer with the primary nucleus from which the actual structure develops,”* (p16). Fish & Scrivener (1990) noted the ability of artists and designers to *“generate, manipulate, combine and inspect in imagination non-existent visual objects,”* (p122), extolling *“the speed and flexibility with which they can be manipulated... for solving complex visual problems, mental images have an advantage over percepts, even computer-generated ones,”* however, *“their disadvantage lies in their haziness and brevity,”* (p123).

On the production of sketches from such mental imagery, Arnheim (1993) described a heavy reliance on generalities and simplification. Bilda & Gero (2005) attested to the benefits of the sketch as a mechanism for recording information: *“externalisation is said to free up the working memory by storing/ externalizing the visuo-spatial information so that the other tasks can be carried out effectively,”* (p146). Tversky (1999) concurred: *“memory limitations can be reduced by offloading memory to external displays that can be inspected and reinspected,”* (p2). Verstijnen et al. (1998) endorsed this, stating *“many artists and designers, when asked for their motivation, ascribe a function of memory extension to their sketching behaviour,”* (p530).

vi. The relationship between cognition and the design process

Scrivener (1997) stated, *“cognition and drawing are related. It’s not... that we only draw because there are cognitive limitations, but that drawing does really support us cognitively as well... cognitive processes and structures determine and are reflected in sketch production,”* (p-). According to Tversky (1999) design often begins as a vague cognitive impression that is externalised to develop it:

“designs are typically too large to be imagined at once. Like other large mental structures, design ideas are then organized hierarchically, with larger units allowing reconstruction of those smaller units contained in them. The order of drawing elements reveals the mental organization underlying the design,” (p5).

Ullman et al. (1990) demonstrated the intrinsic relationship between sketch and mental imagery quality: *“drawings both utilize and determine the cognitive units (design features) ... designer’s cognitive information organization is interdependent with drawing’s characteristics,”* (p268), and suggested the method of externalisation affected cognitive processing: *“the medium used formulates the image chunks that are stored in the long-term memory and later form a basis for generating and inspecting the image in short-term memory,”* (p272). Kavakli et al. (1998) described *“the rich interplay that can arise between external depiction and internal visualisation... is often the key to creative discovery... This reciprocal relationship... is something which would not readily be afforded by a purely mental visualisation,”* (p512). On the speed of sketching, Ullman et al. (1990) suggested, *“the*

method of generating the external image must be rapid and flexible or it will slow down the cognitive processing,” (p-), thereby requiring fluency in its use. This fluency would enable the designer to “externalise a design while directing all the cognitive effort to the design process... the sketching process occupies almost zero cognitive load,” (Plimmer & Apperley 2002, p9).

vii. Quantity

It was considered important to establish whether there was an optimum of sketch output during ideation and did this correlate with the success of design ideation? According to Diehl, M. and Stroebe (1987) and Paulus et al. (2011), *“research has shown a positive correlation between total number of ideas and total number of good ideas,”* (from Kudrowitz & Wallace 2013, p125). Osborn (1963) suggested that *“quantity breeds quality in ideation... early ideas are unlikely to be the best ideas generated during an ideation session,”* (p-). Reinig et al. (2007) proposed their ideation function curve to demonstrate the relationship between the quantity and quality of creative ideas. This presented an S-curve, demonstrating that the most useful ideas appear in the middle of an ideation process. Torrance (1972) suggested that designers who produce more ideas are generally more accomplished at divergent and associative thought and therefore more creative. Similarly, van der Lugt (2003) observed that the best quality concepts are those developed from earlier ideas, suggesting the need for quantity, Kudrowitz & Wallace (2013) also noting that *“individuals who are uninhibited will edit thoughts less, produce many ideas and their output should be less restrained and thus more creative,”* (p133). Despite this, there is no evidence in the literature of an optimum quantity of sketches for this purpose.

viii. Fixation

This was an unexpected but important issue identified from the literature and its relationship to the sketch had to be considered: did it perform a function in fixation, and if so, what? This was described as, *“the blind and sometimes counterproductive adherence of designers to example features and to their own initial ideas,”* (Atilola et al. 2016,

p116). Gero (2011) described it as, *“the inability of designers to see new ways of using objects they are exposed to and the inability to present the use of attributes of an object whether appropriate or not,”* (p108). According to Purcell & Gero (1996), it can be experienced differently according to discipline, its causes being overlapping, and *“is pervasive across different design domains and persists despite warnings from teachers and consultants,”* (Crismond & Adams 2012, p755). Cross (2001) identified that *“fixation in design may exist in a number of forms,”* (p86). It occurred *“where there was ‘unreasonable restriction’ of the search space (when only one or a very few alternative concepts were generated), designers became ‘fixated’ on concrete solutions too early,”* (p88) suggesting the benefit of sketching to avoid this. It also occurred when designers felt pressured to be different, and in cases of *“excessive expansion of the search space,”* (p88), where the production of multiple concepts resulted in fixation on their management rather than their content, and in *“functional fixation... where a mental block is created that inhibits a person from using an object in a new way,”* (Atilola et al. 2016, p116).

Atilola et al. (2016) demonstrated that designers given examples to work from, i.e.; in the form of photographs, models and images, were more likely to fixate to them: *“though the intent for using these visual examples is to provide inspiration to the designers, designers’ fixation to components of the example hinders their creativity,”* (p116). Quality of stimuli was an issue: *“in fixation studies that use poor examples... designers copy the poor features of an example without realizing that they are doing so,”* (p117), (a phenomenon commonly seen in studio sessions with novice designers).

2.4.3. Phase I findings: Sketching – Objective 3

To establish the current position and status of sketching within contemporary design higher education alongside other concept development tools.

i. Teaching & learning

The literature evidenced much disparity regarding the importance of manual sketching within design courses. Also of interest was discussion of an *ideal* in terms of sketching – as opposed to what actually exists.

Schenk's (2005) longitudinal study into the teaching and learning of sketching was of particular interest and acknowledged the historical problems of teaching drawing. Quoting Bell (1963), in 'The Schools of Design,' she referred to the ongoing argument between teaching paradigms within institutions, even at that time, drawing for design needing to be, "*conducted with reference to the use to which it is to be applied,*" (p-). Lambert & Firth, (2006) referred to the same issue in Powell's 1985 publication 'Presentation Techniques,' where he described drawing as one of the "*forgotten subjects of design education,*" (p-). Lambert & Firth (2006) continue: "*today the teaching of drawing as a design skill has been overlooked even more to make room for the necessary acquisition of new skills, like 3D CAD modelling,*" (p1). Even today, the issue exists, observed by Corremans et al. (2018): "*if design schools want to improve the quality of their students, they should invest in hand drawing courses, and in the enhancement of students' sketch quality,*" (p2418).

The apparent lack of consistency in the teaching and learning of drawing could possibly be explained as part of a wider lack of intellectual rigour identified by Wang (2010). He referred to Schön (1984), purporting that "*intellectual rigour is often conspicuously absent in the design studio, and such a lack is very problematic for any attempt to integrate design education with the general model of university education,*" (Wang 2010, p177). He believed the approach to teaching traditional academic subjects was entirely at odds with the teaching of creative subjects: "*the current positivist paradigm does not adequately account for irrational creativity,*" (p179).

ii. Paradigmatic issues

Wang (2010) suggested that, historically, "*tacit subjective knowledge and irrational creativity have always existed at the core of the designing process... the artistic dimension of designing has often been thought to be somewhat lacking in academic respectability,*" (p181). He described "*the leap in the dark,*" (p180), for which the sketch is often responsible –

this being anomalous in a positivist approach and therefore discounted for its lack of rigour: *“as long as positivism is assumed as the paradigm for design education, the subjective and irrational and ultimately mysterious and ineffable nature of design creativity can never be defined and explicated. If this is so, the full glory of academic respectability will always elude design education,”* (p180).

Despite this, in recent years Wang (2010) observed an apparent, (and welcome) shift within design education, *“from positivism to complexity theory (that) has offered... design educators to regard their work as being intellectually rigorous after all,”* (p181). Although in its infancy, this approach has enabled design projects - within which the sketch is intrinsic - to be viewed as *“intricate systems having many possible relations and meanings that might be defined through both rationality and creativity,”* (p181). Such an approach would *“incorporate spontaneous invention as a natural feature of the process... complexity theory suggests that the automatic and unpredictable generation of new properties is what should happen within complex systems,”* (p179).

iii. Attitudes towards the sketch

Of particular interest was Schenk's (2005, 2007a, 2013) study which engaged with designers and educators over a twenty year period, the over-riding conclusion being that *“drawing remains at the very centre of the creative and developmental process of design,”* (Schenk 2007a, p3). Respondents confirmed that the sketch was vital for both conceptualisation and communication, and that despite the rise of digital tools, the necessity for traditional drawing to fulfil such tasks would always exist, (Schenk 2005).

In Schenk's earliest study, (1989), all educator respondents ranked drawing ability as *essential* or *important*. The most recent study observed a shift in attitudes: two thirds of respondents were of the same opinion, but an emerging minority believed it was either just *useful* or *irrelevant*, (Schenk 2005). Additionally, a small number of participants believed that drawing was of no relevance: *“paper-based drawing may be seen as conservative, even reactionary,”* (Schenk 2013, p17).

Schenk (2005) reported that, within higher education *“drawing is not a subject that institutions feel they must be prescriptive about, preferring to leave decisions about tuition to individual course teams,”* (p200) – she referred to educators believing drawing was only relevant if it directly supported student work and should only be taught on a need-to-know basis - however, *“without drawing students are not connected with a direct route to their thinking”* (p200). In addition to this, drawing tuition had been demoted within a growing curriculum: *“the gradual addition of other subjects to the curriculum, including teaching the use of computer software, had made it difficult to find the time and resources necessary for drawing tuition,”* (Schenk 2005, p7).

Industry reflected upon the position of sketching within education. Graduates and interns were referenced as having poor skill levels, affecting detrimentally the practices employing them: *“a lack of drawing ability in design students and in new entrants to the design profession is seen as a problem by many industry-based designers,”* (P Schenk 2005, p8). This was embodied in *“limited ideas and... inadequate capacity to express them,”* and *“an overall lowering of standards in drawing ability,”* (p8). Schenk (2005) cited the importance of good sketching skills among graduates, referring to the dean of a design school: *“industry has told us they want students who can draw,”* (p8). Similarly, from industry: *“clients and employers seek out their students particularly when they demonstrate conventional drawing ability,”* (ibid).

The perspectives of students were interesting, reflections of their education being relevant to the study. According to Lambert & Firth (2006), their concerns may be displaced: *“while students worry about their employment prospects because their CAD skills might not be strong, there is growing evidence that employers are demanding greater skills in sketching,”* (p2). Concerns of educators have been echoed by students: *“in recent years there has been a growing concern among teachers... that some... students do not draw at all well. More crucially, those same students would like to draw better and to use drawing within their practice,”* (McManus et al. 2010, p19).

Jonson (2005) made several interesting observations: *“students said that they would have liked to do more sketching, which they considered a skill... (and) felt they lacked opportunities for sketching in set projects, and that studio teachers were not always seen as role models for sketching,”* (p623). Even at post graduate level, students have expressed concern about their skill levels: *“at the Royal College of Art... students on all courses, both fine arts... and more applied courses... have reported problems with drawing,”* (McManus et al. 2010, p19).

iv. The fine art/design dichotomy

The strained relationship between fine art and design was apparent. Schenk’s (2005) study reported that the majority of drawing tutors are themselves fine-art educated and that *“tuition where a contextual or aesthetic position is implied and not declared as such is no longer appropriate,”* (p196), such *“purist polarized attitudes to drawing are now anachronistic,”* (ibid). Similarly, in schools and on foundation courses, Jones et al. (1984) observed students being taught to draw by teachers trained as fine artists:

“few of these teachers seem to have noticed that, even when the greatest painters, such as Leonardo, Raphael, Michelangelo, started to design, they instantly fell into another convention of depiction... these masters thought not in painter’s pictures, but in traditional architectural conventions,” (p271).

They concluded that *“drawing that is truly useful for designing is a difficult skill to acquire when... confused with that for picture making,”* (p275). They noted that creating a replica of an external object,

“says nothing about designing; that act of originating... what is at issue is not the role of drawing in depicting images... but in creating them. Using objective drawing as a creative tool turns out to be very difficult when it is merely aimed at the outcome of mental processes and not at the decision-making steps themselves,” (p270).

Schenk (2005) reported that although drawing tuition was still part of the designer’s curriculum in most instances, there was still pressure coming from the two schools of thought: the drive for a return to classical, academic drawing instruction based on observation of objects, and in contrast a move away from this towards a more fluid,

inclusive approach: *"drawing should and can be done anywhere"* (p199). Leblanc (2015) similarly believed that *"design educators need to reassess the pedagogic relevance of certain tools to ensuring adequate design skills... the relevance of some should be questioned, while others may need reviving,"* (p-).

v. Quality of tuition

A lack of teaching in respect of sketching skills was clearly evident, Leblanc (2015), among many others, reporting an inability among students to ideate as a result of ineffective tuition. This, despite strong evidence that *"students with a higher quality in sketches, are more likely to produce better design outcomes,"* (Corremans et al. 2018, p2418) and that *"drawing training in itself makes people more creative,"* (p2412). Cuff (1980) identified this issue in architectural education: *"in spite of drawing's central role in architecture, the education of would-be professionals is often deficient... students are expected to 'pick up' drawing,"* (p5). Buxton (2010) believed that the informality of sketching was responsible for a similar informality in attitude towards its teaching, and Gross & Do (1997) cited the studio culture as responsible for lack of structured teaching, one where *"every student must independently develop (their) own process or method of design,"* (p2), most gaining their skills from *"imitation of their teachers and more senior classmates,"* (ibid), and, according to Leblanc (2015), only *"those with high ambitions and strong self-motivation manage to overcome the deficit,"* (p-). *"The beneficial effects gained through the 'difficulty and discipline' of drawing had been lost to the detriment of the educational experience of design students,"* according to Schenk (2005, p196), whereby *"students grasp the required notions only superficially, finishing their schooling with an inadequate skill set and a sense of ineptitude,"* (Leblanc 2015, p-).

vi. The change in student profile

The nature of students as they present themselves to the learning of sketching was of interest to the study. Schenk (2005) identified *"a higher proportion of design students with little established drawing skill when they join design degree courses,"* (p9), due to *"profound changes in the profile of the student intake to design courses over the twenty... years... and the*

implications of these changes on the teaching of drawing have similarly been subject to scrutiny,” (Schenk 2007b, p2). She referred to Nussbaum (2009), describing ‘Generation Y’ – the age-group currently occupying places HE and with huge formative experience of digital cultures: *‘they live on digital platforms that are ever changing. They inhabit a participatory media that gives them the tools to create, share and re-appropriate content.’* (Schenk 2013, p16 from Nussbaum 2009). Such students *“have had little opportunity to develop traditional drawing skills while at school but... are highly computer-literate,”* (Schenk 2005, p202), and believe *“they can use the computer for any aspect of the design process which their predecessors conducted through drawing,”* (Schenk 2007a, p2). Siemens (2008) also referred to Millennials, (the predecessors of Gen-Y, but equally tech-savvy), as having *“expectations of education as a participative, engaging, and active environment,”* (Siemens 2008, p6). Skiba (2005) noted that *“Millennials experience and expect immediacy... they value speed more than accuracy”* (p370) – this sometimes conflicting with the persistence and application needed to become adept at sketching.

Recruitment processes have also changed over time, institutions now requiring a wider set of skills: *“academics look for different ranges of abilities now than in the eighties, with more emphasis on intellectual rather than purely practical skills,”* (Schenk 2005, p9). As a result, graduates leave education, *“unsure about how to maximize the opportunities that drawing facilitates,”* (Schenk 2013, p16).

vii. The effective tutor

Understanding the teaching & learning of sketching in HE was of vital importance to the research, and a profile of the ideal tutor was apparent from the literature. Although Schenk (2005) identified mixed opinion in her study, she noted a preference for tutors with a deep understanding of the design process. Demirkan (2016) identified the importance of encouragement beyond purely imparting knowledge: *“a facilitator”* (p28). Similarly, the need for a tutor who could deliver both didactic and personal support was identified by Corremans & Coppieters (2017), *“to stand in front of... the student to actually teach... drawing skills... the teacher as the expert is still needed for*

immediate feedback (and) to familiarize students the almost unlimited possibilities and the wide range of good examples,” (p3). Schenk (2005) described her vision for a drawing tutor as, *“somebody who loves and has a deep understanding of the subject... who has both scholarship and skill, and someone equipped to blend traditional academic drawing with experimental approaches,”* (p198).

viii. Appropriate sketching tools

Schenk (2005) reported that these should be *“both perceptual and conceptual... the ability to express perception is desirable but the ability to formulate concepts is essential,”* (p194). Jones et al. (1984) acknowledged they should be used *“as part of the process of vicarious object making and not as a process for real picture making,”* (p273), used as a *“dimensional and constructional tool,”* (ibid). The time needed to acquire fluent sketching skill was clarified, Schenk (2007a) stating, *“as with any language, the language of drawing takes time to learn and that can be difficult,”* (p2). This required development of *“hand-eye coordination, the handling of drawing media, the understanding of visual form,”* (ibid). She had observed *“a substantial amount of time, generally a day a week or equivalent, was devoted to drawing or visual studies including life drawing and other forms of tuition based on observation,”* (Schenk 2005, p199), although noted that this was often discipline-specific and varied accordingly. She also endorsed the gaining of confidence and need for regularity of drawing activity, including attendance of classes, as essential for maintaining skill level (Schenk 2005).

The need for contextualised tuition for students was identified: *“developing a form of drawing most suitable to their own needs as designers,”* (Schenk 2005, p196). Industry-relevant skill was also considered important: *“tuition for specific aspects of drawing related to professional practice,”* (p197). Additionally, it was described as needing to be easily accessible: *“nomadic and of simple means... it must be mobile,”* (Schenk 2005, p199). Theoretical context was also considered. Although a practical skill, the idea of developing theoretical understanding of the processes and uses for drawing was mooted. Schenk (2005) reported that over half her respondents considered this of

value, and would enable students to *“develop appreciation beyond their own particular range of skills and experience,”* (p197). The issue of copying was raised in Schenk’s (2005) study – and appeared contentious. Despite most respondents rejecting the notion, some championed it - its ability to offer similar benefits to that of observational drawing. Schenk believed it was *“a neglected form of learning about the construction of images... it should be reconsidered as an aspect of the curriculum, and... as a relevant sketchbook-based activity,”* (Schenk 2005, p197).

ix. Cognitive support

The acknowledgement of the sketch for cognitive support by educators appeared to be minimal. Demirkan (2016) believed *“it is important that methods and knowledge are linked in designers’ cognitive strategies,”* (p29) – something generally non-existent in HE studios. Cuff (1980) described the general attitude of educators and students towards the sketch and its role in ideation:

“the underlying premise assumes an interdependent relationship between thought and any expressive format, be it language or drawing... They do not realize that ideas and drawing must be completely intertwined; one cannot draw without ideas... ideas and drawing ability improve together gradually... mental imagery problems are particularly interesting; if drawing influences thinking, the more drawing they do, the easier such mental processes will become,” (p5-7).

As a result of this, Cuff (1980) believed that the sketch was being used divergently in the studio, the student attempting to produce pleasing drawings while the tutor attempts to teach expansiveness of thinking.

Similarly, Leblanc (2015) observed that, *“thinking while exploring is a process difficult to instil and its intellectual dimension is widely ignored,”* (p-). She noted the result among students of such disconnect between the cognition and representation, *“many do not know how to use it as a thinking tool... they tend to skip parts of the development process: the doodling, exploring, comparing and assessing that help them refine the initial intent into a mature design,”* (p-). Through practical exercises, her students were able to overcome the dearth of ideas that often accompanied sketch avoidance. By pushing them to

produce over a hundred thumbnail concepts, she observed, *“only when students reached the point of wondering what else to do did they actually start experimenting, exploring and producing unexpected results. This ‘tipping point’ is precisely the aim of the exercise,”* (p-).

This lack of understanding about the cognitive benefits of the sketch affected students’ control over the ideation process. Leblanc (2015) observed:

“whenever an idea is challenged, students simply change direction instead of creatively resolving its weak points. Many simply don’t know what to do with the feedback or how to explore options and variations. Advice to develop an idea further is usually interpreted as ‘continue searching for another’. Thus, when students encounter a problem, they simply abandon one idea for another,” (p-).

x. Types of learning experience

The embedding of the sketch within other teaching and learning activities was apparent and regarded as beneficial. Stones & Cassidy (2010) posited that *“tool choice can have an impact on design thinking and thus makes a case for the two areas becoming more strongly pedagogically linked at module level,”* (p458). Schenk (2005) endorsed the benefit of embedded activities, her study revealing that *“through the integration of drawing tuition with projects... students learn to develop their own individualistic approaches, and learn how to use drawing appropriately for professional practice,”* (p201). Booth et al.’s (2015) study reported student responses to sketching using this approach: *“I feel that it should be incorporated in every design class because of its flexibility, ease and usefulness,”* (p13), adding, *“the number of students who reported being frustrated with sketching dropped from 4 to 0,”* (ibid). Indeed, the very process educators have been trying to get students to engage with appeared to have finally ‘clicked’ in the minds of students, one stating: *“I will now begin the design process with freehand sketching... I will now produce multiple sketches instead of trying to get the design perfect on the very first sketch,”* (ibid).

Despite this, Leblanc (2015) did note a common issue among students - their tendency for isolating learning experiences: *“an exercise is only valuable when students grasp its purpose and learn to use the newly gained skills in their respective fields. Yet many tend to*

compartmentalise the knowledge and move on as soon a course or an exercise is completed,” (p-) – this applying to sketching alongside other skills. This issue could be apportioned to the structure of taught programmes: Schenk (2005) described drawing being taught and assessed separately from design activities during the early stages of degree courses, and later embedded within projects and assessed as part of them. Leblanc (2015) suggested that, *“a systematic enforcement of newly acquired skills is needed to improve assimilation of the knowledge and help turn it into competencies,”* (p-).

xi. Alternative sketching methods

Although this study considers the sketch within ideation, the literature did reveal additional representation methods that could be considered alongside it and which refer to the objective under consideration here. Gross & Do (1997) specifically alluded to the use of *“drawings and three-dimensional models,”* as *“representations to inquire, analyse, and test hypotheses about the designs they represent,”* (p9) – these sitting comfortably within the realm of ideation. Schenk (2005) described encouraging students, *“to alternate, as appropriate, between modelling systems that involve paper-based drawing and the use of three dimensional materials,”* – clearly placing the latter alongside the traditional two-dimensional sketch.

xii. Digital tools

The use of digital tools was an area of considerable interest, and had had a considerable effect on teaching and learning: *“when asked to describe the ‘ideal studio’, it was very interesting to see how the use of the computer has influenced attitudes towards the provision of facilities for students,”* (Schenk 2005, p198). Demirkan (2016), believed their ubiquity had altered the concept of the traditional ‘studio’ towards *“a technology enhanced active learning space,”* (p28). Their benefits to the design process were clear, providing *“limitless space, easy editing... and the digital artefact is simple to store and transfer,”* (Plimmer & Apperley 2002, p10), and are *“a medium of considerable promise for the manipulation and storage of visual imagery,”* (Fish & Scrivener 1990, p117). They *“combine the concreteness of drawings with a light-footedness,”* (Arnheim 1993, p16). Schenk

(2005) observed that, *“certain types of software can help express and even resolve ideas when limited drawing ability might be problematic... (enabling) good concepts through visually-convincing images that they could not have produced otherwise,”* (p195). As a result, *“students no longer have to learn to use drawing to support the erstwhile essential and difficult skills of detailed resolution and rendering,”* (Schenk 2005, p200).

Jonson (2005) bemoaned a lack of research into such tools: *“the role of sketching may not have been sufficiently examined or challenged in the digital age, including the view that... CAD is an inappropriate means for conceptualisation,”* (p613). Stones & Cassidy (2010) also described a *“tension in the fundamental visual qualities of marks,”* (p444) made by manual and digital tools. The sketch *“celebrates ambiguity, the computer’s mark, by default... appears decisive... ambiguity is to be highly valued and thus there is a strong case for suggesting that paper-based working can aid the reinterpretation of ambiguous marks,”* (ibid). Kavakli et al. (1998) refer to the sketch offering *“vagary, inconsistency, and ambiguity... these characteristics are the anathema of algorithms, they are the essence of design,”* (p487).

The problematics of digital tools were evident. Fish & Scrivener (1990) described the *“predictability of many computer sketching functions (that) inhibits... the serendipity that may accompany the vagaries of conventional media,”* (p117): *“The precision and realism of the image generated by such systems may inhibit the formation of the percept-image hybrids so important in the early stages of problem solving,”* (Coyne et al. 2002, p125). Stones & Cassidy (2010) identified a further issue: *“rather than seeing new opportunities, marks are being compared against the accuracy of a mental image,”* this being *“more prevalent when working digitally than when working on paper,”* (p456).

Leblanc (2015), described student perception of digital tools as *“more gratifying”* and believed they circumscribed the ideation process to its detriment, *“less time is committed to imagining, exploring or developing ideas and more time to visually enhancing or embellishing them,”* (p-). Eckert et al. (2012) observed this during their Across Design workshops: *“younger members of the various design professions turn to computers too early in the design process,”* (p252), and expanded upon by Lambert & Firth (2006):

“frustrated at their inability to develop forms through quick sketches, students turn to 3D CAD modelling too early in the design process, applying time consuming detail before a variety of ideas have been tried and more fundamental issues have been resolved, like whether it will work or not, i.e. before they have thought it through,” (p5).

Leblanc (2015) suggested that digital tools made it difficult to follow the progress of many students concurrently: *“learning from one another and measuring one’s own performance by comparing it with others are important to education,”* (p-). Additionally, she cautioned, *“if tools embellish irrelevant ideas, camouflage problems and give students a false sense of accomplishment – or worse, are mistaken for ‘good design’ – then they may need to be called into question,”* (p-).

The digital aesthetic was an issue. Leblanc (2015) believed computers could, *“transform rudimentary visions into something polished, giving the false impression of a ‘finished’ design,”* (p-). Arnheim (1993), had voiced the same concern much earlier: *“computers can... be accused of a seductive irresponsibility, that allows them to ignore the tangible conditions of materials as well as perceptual experience,”* (p16). Stones & Cassidy (2010) suggested that *“digital marks have a finished appearance, such as a rendered typeface or a shape selected from a menu... the digital mark, when used in the early stages of design could... prove destructive and restrictive, unless it is deliberately subverted,”* (p442). Coyne et al. (2002) noted that digital tools, *“introduce a language of hygiene... a very clean world compared with the manual world,”* (p272), and suggested, *“this property seems to inhibit the use of the computer for sketching,”* (ibid). Schenk (2007b) concurred with this: *“while computer-aided systems can provide a viable substitute for many of the skill-based drawings associated with the resolution, presentation and production of design solutions, they do not support early ideation,”* (p5).

With digital sketching, as opposed to traditional CAD systems, it would appear that ideation could be more easily achievable using this type of platform. However, despite the simplicity of the sketch, Fish & Scrivener (1990) described the problems of creating such a tool: *“the suggestive indeterminacies of sketches, so useful for mental processing, thus constitute one of the hardest denotation systems to manipulate in the typical raster graphics paint box system,”* (p224), thus requiring *“the study of the invisible mental processes that*

result in the visible activity of sketching,” (p117). More recently, Plimmer & Apperley (2002) observed, *“the requirements for a sketching medium are simple, yet few existing computer interfaces facilitate true sketching... providing a sketching interface that is more useable than the more formal alternatives has been technically difficult from both a hardware and software perspective,”* (p9).

The effect of digital tools use upon students was evidenced. According to Stones & Cassidy (2010), *“students judged their work using a different set of criteria when designing with the computer and that a finished appearance forms part of that judgement,”* (p442). They warned that students, *“mesmerised by the magical powers of computers are losing the ability to improvise,”* (p458) and compared this with what appeared to be a healthier approach to manual tools: *“the sketch was expected to be rough and purely indicative of form,”* (p456).

Schenk's (2013) study revealed that although digital technology had brought considerable advantages to the design process, all participants had expressed concern about the lack of drawing skill among students, traditional drawing dropped in favour of adoption of such tools at an early stage in their education. Her research suggested, *“increasing reliance on this technology undermines the acquisition of fundamental drawing abilities for students, with consequences for their creative potential,”* (p-). She believed that, *“without experience of the ‘physical’ world of paper-based drawing, students will struggle to understand many of the tasks that the digital media have been developed to perform,”* (Schenk 2005, p8).

Although the literature pointed to benefits of digital tools at specific points during the design process, the evidence suggested exercising caution in their use during ideation. Indeed, comparison of the two approaches led some to suggest that digital tools may be wholly inappropriate for ideation. Scrivener (1997) referred to his survey of architectural practices where a variety of ideation tools were available for use – despite this, he noted that most conceptualisation was conducted through the use of manual sketching. Stones & Cassidy (2010) referred to Goel's (1995) comparative work, noting that notwithstanding the use of digital ideation tools, reinterpretation levels (and

thereby, creativity), were much greater during the use of sketching. Similarly, Bilda and Demirkan's (2003) protocol experiments demonstrated that analogue media offered an advantage over digital tools in enabling identification of visuo-spatial cues during ideation. Designer behaviour during ideation was noted by Lim (2003) as *"fast and ambiguous yet creative, and most of the designers are still relying on the conventional media – pen-and-paper"* (p616). Ironically, Landay (1996) noted that despite the ubiquity of digital tools, *"designers admit that they trace over their computer output with pen to present a first draft to clients,"* (p10) – possibly supporting the notion of the sketch providing ambiguity and a less finalised aesthetic more appropriate to that stage of the design process.

Despite their clear benefits, Schenk (2005) offered advice as to the use of digital tools during ideation: *"student designers still need to improve their drawing abilities,"* (2007b, p13). They *"must still achieve clarity in their imagining and ideation before moving into the digital domain and that gaining experience of traditional drawing methods (is) the best way to achieve this,"* (p201), *"the best 'software' they have access to is always in their heads and the best interface with this software is through their use of drawing,"* (2007a, p9).

2.4.4. Phase II findings: Sketch Inhibition² - Objective 4

To establish the extent of sketch inhibition as a phenomenon and whether this is problematic to the design process.

The literature provided no quantifiable data relating to the extent of inhibition within higher education. However, a useful taxonomy was provided by Booth et al. (2015) that identified several specific forms of sketch inhibition. Individual inhibition, (that pertaining to the sufferer alone), could be caused by a lack of awareness of the benefits of the activity, (an intellectual inhibition). Skill set inhibition was another form, caused

² to prevent confusion with Turnitin, it must again be pointed out that much of the literature considered within this section has previously been published in Thurlow & Ford (2017), Thurlow & Ford (2018a), Thurlow & Ford (2018b) and Thurlow, Ford & Hudson (2018).

through lack of exposure and experience with sketching. Additionally, personal inhibition embodied the lack of flow caused by not being *in the mood* to sketch (situational inhibition), or the need for perfection in output.

Social inhibition was also identified by Booth et al. (2015); the fear of judgement by others and the comparisons made between output of individuals causing anxiety. Farzaneh et al. (2012), (from Diehl & Stroebe 1987), referred to social loafing – an issue in group situations (and a common phenomenon in HE studios), a lack of participation and input on the part of weaker or inhibited individuals fuelled by either fear of criticism or laziness. Technological inhibition was also cited by Booth et al. (2015), describing the preference for individuals to defer their activity towards, more often than not, digital tools.

2.4.5. *Phase II findings: Sketch Inhibition - Objective 5*

To explore the nature, common causal factors and effects of sketch inhibition among designers.

As previously presented in Thurlow, Ford & Hudson (2018), *“these have been identified... as belonging to the broadly distinct areas of psycho-social, intellectual, skill-set and technological, or a combination of these”* (p-). Farzaneh et al. (2012) identified the, *“cognitive effects (of) social inhibition, social loafing and production blocking diminish the number of solution ideas generated by groups,”* (p5) and referring to observed behaviour within group situations: *“negative criticism corresponds to utterances...negative statements (or) questions (or) jokes and laughter,”* (p6), all of these having an inhibitive effect on the generation of solutions. Although not referring specifically to the act of ideation sketching, this is highly applicable to such activity.

In addition to Booth’s (2015) taxonomy, Leblanc (2015) suggested that educational factors are causal of sketch inhibition among student designers, (this, originally presented in Thurlow & Ford, 2018a, p2522-3 and shown below):

“Leblanc (2015) highlights the lack of understanding of the sketching tool at institution level. ‘We continually observe students struggle with the creative process...exploring and developing ideas into mature design,’ (p. 1)... Tutors have also been victim of what appear to be beautifully rendered images of students’ final designs, only to discover that they contain little more than the primitive shapes: ‘if tools embellish irrelevant ideas, camouflage problems and give students a false sense of accomplishment—or worse, are mistaken for “good design” - then they may need to be called into question,’ (Leblanc, 2015, p. 6).”

Her studies of undergraduates at Montreal University suggest that, *“many see sketching only as a means of visualization and rarely know how to use it as a creative thinking tool,”* (Leblanc 2015, p1).

With regard to the causes of sketch inhibition, fear of failure is cited by both Booth et al. (2016) and Leblanc (2015), whereby the normal process of experimentation during design development is circumvented, the inhibited student assuming this is somehow unacceptable. *“Because of this fear, students rush into visualisation as soon as they have a suggestion of a concept, omitting stages of evaluation and refinement essential for a fully developed design solution,”* (Thurlow & Ford, 2018b, p2044).

The excessive and ill-considered use of digital tools was a common observation. Leblanc (2015) observed a generalised overreliance upon technology and its effect upon sketch inhibition. She stated that such tools were more gratifying for the student, often resulting in them being erroneously *“judged by their skills with these tools rather than their creativity or problem-solving ability,”* (p5).

Inexperience in the use of sketching, and subsequent deferral to digital tools was considered by Coyne et al. (2002) who noted, *‘if you only know how to draw a box, your building will be a box, and if you know how to design anything on the computer you can design anything’* (p270). Furness (2016) additionally noted that students are more likely to possess a blog than a notebook, the instant gratification of digital methods and rise of social media proving too alluring for students to ignore: *‘Millennials experience and expect immediacy,’* (Skiba 2005, p370).

Recent changes in the higher education landscape were also identified as responsible for an increase in sketch inhibition, (from Thurlow & Ford, 2018b, p2044-5):

“... the expansion in the number of higher education design courses over recent decades may have, ironically, had a part to play in the increase in numbers of inhibited students. This has come about due to some institutions applying a less rigorous approach to recruitment.”

Lambert & Firth (2006) also observed that, *‘applicants no longer have to compete against each other, and consequently students’ drawing skills upon embarking on a design degree are generally much less adept than in the 1980s,’*(p5).

Additionally, the Informed Design Teaching & Learning Matrix, (see figure 15 below), modelled by Crismond & Adams (2012) was of interest. It compared the difference in approach between the beginner and informed designer, and although developed within a United States K-16 engineering education environment, it was pertinent to this study. The effects of sketch inhibition appeared to sit comfortably, albeit unintentionally, throughout the section: *What beginning designers do*, (shown by the shaded area). The section: *Represent Ideas*, referred to sketching explicitly and appeared demonstrated two things: 1. the relevance and benefit of sketching throughout the entire ideation process, and, 2. that the difference between the beginner and informed designer activity can, without exception in this model, be attributed to use of sketching as a cognitive tool to increase efficacy.

DESIGN STRATEGIES	BEGINNING Vs. INFORMED DESIGNER PATTERNS	
	WHAT BEGINNING DESIGNERS DO	WHAT INFORMED DESIGNERS DO
Understand the Challenge	Pattern A. Problem Solving Vs. Problem Framing	
	Treat design task as a well-defined, straightforward problem that they prematurely attempt to solve.	Delay making design decisions in order to explore, comprehend and frame the problem better.
Build Knowledge	Pattern B. Skipping Vs. Doing Research	
	Skip doing research and instead pose or build solutions immediately.	Do investigations and research to learn about the problem, and how the system works.
Generate Ideas	Pattern C. Idea Scarcity Vs. Idea Fluency	
	Work with few or just one idea, which they can get fixated or stuck on, and may not want to discard, add to, or revise.	Practice idea fluency in order to work with lots of ideas by doing divergent thinking, brainstorming, etc.
Represent Ideas	Pattern D. Surface Vs. Deep Drawing & Modeling	
	Propose superficial ideas that do not support deep inquiry of a system, and that would not work if built.	Use multiple representations to explore and investigate design ideas and support deeper inquiry into how system works.
Weigh Options & Make Decisions	Pattern E. Ignore Vs. Balance Benefits & Tradeoffs	
	Make design decisions without weighing all options, or attend only to pros of favored ideas, and cons of lesser approaches.	Use words and graphics to display and weigh both benefits and tradeoffs of all ideas before picking a design.
Conduct Experiments	Pattern F. Confounded Vs. Valid Tests & Experiments	
	Do few or no tests on prototypes, or may run confounded experiments that cannot provide useful information.	Conduct valid experiments to learn about materials, key design variables and the system work.
Troubleshoot	Pattern G. Unfocused Vs. Diagnostic Troubleshooting	
	Use an unfocused, non-analytical way to view prototypes during testing and troubleshoot ideas.	Focus attention on problematic areas and subsystems when troubleshooting devices and proposing ways to fix them.
Revise/Iterate	Pattern H. Haphazard or Linear Vs. Managed & Iterative Designing	
	Design in haphazard ways where little learning gets done, or do design steps once in linear order.	Do design in a managed way, where ideas are improved iteratively via feedback, and strategies are used multiple times as needed, in any order.
Reflect on Process	Pattern I. Tacit Vs. Reflective Design Thinking	
	Do tacit designing with little self-monitoring while working or reflecting on process/product when done.	Practice reflective thinking by keeping tabs on design strategies and thinking while working and after finished.

Figure 15: The Informed Design Teaching & Learning Matrix, representing the symptoms of sketch inhibition throughout the design process – as shown by the shaded areas.

Source: Crismond & Adams, 2012

The educational experience of sufferers prior to HE was of interest - this may disclose data to evidence a relationship between inhibition and the study (or not) of art and design subjects. Figures from A-level exam boards were obtained to describe the type of art and design education students had received before entering higher education.

In June 2001, 36,085 students sat exams in A-level art and design subjects. This comprised 5.25% of the total 686,486 A-level examinations sat that year (JCQ 2001). In June 2017 828,355 A-level examinations were sat, 43,242 students sat A-level art and design subjects, 5.22% of all A-level examinations taken in that year, (JCQ 2017). All five exam boards in England and Wales provide Fine Art A-level or fine art based route, and in addition to this, all provide routes or individual examinations in Graphical Communication, Textile Design, Three-Dimensional Design, and Photography. In addition to this AQA, OCR and CCE offer a broad Art, Craft and Design A-Level, (AQA 2015, CCEA 2016, Edexcel 2016, OCR 2014, WJEC 2015).

Figures obtained from the AQA, for A-levels in art and design subjects confirmed that 33% of students took Fine Art. Of the remaining 66% of students who took an art and design based A-level that was not Fine Art, 30% took Photography, 14% took Art, Craft and Designing, 12% took Graphical Communication, 9% took Textile Design, and 2% took Three-Dimensional Design, (AQA 2017). Although the number of students taking art and design related A-levels had not changed from 2001-2017, the latest figures revealed that two thirds of students undertaking art and design A-levels did not study a fine art syllabus including the fundamental skills of drawing.

2.4.6. Phase II findings: Sketch Inhibition - Objective 6

To develop a pedagogic framework for design education.

Booth et al. (2015) referred to previous efforts by others to reduce inhibition. These included the requirement for sketching activity during homework activities and through the hybridised use of manual and digital tools. They also referred to another

method that appeared successful: *“to draw a dream house prior to a concept generation activity,”* (p4) and, according to Pable (2008), the use of art-based techniques.

Booth et al.'s (2015) paper presented their experiment into reducing sketch inhibition among undergraduate engineers. It required them to engage in sketching workshops monitored using galvanic skin response (GSR) and followed up with a NASA TLX questionnaire to establish emotional response to the process. Workshops included addressing,

“tools, lines and weights, perspective, Boolean construction, context, and motion. For tools, we provide each student with a blue watercolour pencil and an ultrafine, dual-tip marker pen. We instruct students on how to draw straight lines in one stroke, and how to make different line weights with their tools,” (p5).

The GSR and NASA TLX tests proved, *“generally positive and suggested that the students felt less inhibited... (participants) reported that the workshop ‘made me feel relaxed’ and it allowed ‘your mind to run free’... liking the easiness of the workshop, liking the freeness of it, and having general positive feelings such as it being ‘fun’,”* (Booth et al. 2016, p16), *“89% of the students reported liking the workshop. Many reported feeling more at ease, or feeling freer,”* (p14). In addition to this experiment, Booth et al. (2016) reported observations from Schmidt et al.'s (2012) experiments with mandatory sketching during tasks: *“this increased the rate at which students reported sketching to be important,”* (p4).

Hu et al.'s (2015) use of fine art-based exercises among inhibited subjects also returned positive results:

“those who did a warm-up prior to ideation had a decrease in stress, especially for those who were personally familiar with the design problem. The art activities especially improved engagement for younger participants. We also saw that females who used the art-based activities reported lower mental workload during ideation and greater pride in their sketches,” (p1).

Interestingly, some aspects of drawing activity were deemed unhelpful in reducing inhibition. Booth et al. (2016), suggesting,

“they should deemphasize sketch rendering and delay perspective drawing until a later date, since this increases the cognitive load.... the use of perspective may be a difficult skill for students to master, which has been historically true for artists as well,” (p20).

Cognitive load was an issue for participants, and appeared to increase with the use of sketching: *“learning new skills increases the difficulty of a task,”* (Booth et al. 2016, p19, from Lawson & Dorst, 2009). They also reported that *“mental demand and effort decreased over the semester,”* (Booth et al. 2016), suggesting the possibility that increased sketch fluency might reduce mental load.

Pastoral support was considered important - Booth et al. (2015) observed *“the need for continual encouragement and practice in order for certain habits to stay,”* (p9), confirming the benefits of ongoing skill maintenance - workshops that included the provision of *“practice time, and heavily emphasize context, motion, ambiguity and speed in sketching,”* (p20). They referred to Van Passel & Eggink's (2013) study which *“used a supportive educational atmosphere and found that fostering the confidence of students tended to help them acquire sketching skills more quickly,”* (from Booth et al. 2015, p4). Booth et al. (2015) reporting, *“While the first module addresses inhibition related to a lack of skills, other types of inhibition were still being reported by students. Consequently, we developed a second module to address personal, intellectual, social, situational, and comparative inhibition,”* (p4).

2.5. In conclusion

The literature provided an enlightening underpinning to the study, despite there being very little specific extant data on sketch inhibition. The value of the mind mapping activity was doubtless, identifying areas of literature that benefitted and contextualised the study.

Unexpected was the *extent* of the benefits of the sketch, the data supporting its use during ideation, copious and unquestioned. The positive, symbiotic relationship between sketching and creativity became evident early on, this aiding the processing of large amounts of information during design problem-solving activity. It enabled the effective framing of design problems, (typically being *fuzzy* and complex), and

provided a supportive visual bridge between knowledge and concepts during the growth of ideas.

The functions of the sketch during ideation were numerous. Its use as a tool for reflection, manufacture, conscription and for the communication and storage of information (cited in various forms), suggested a tool far more critical to successful design than first thought. Its ambiguity enabled representation of thought whilst allowing for reinterpretation – a quality not present in other forms of communication. It also appeared an effective decision-making tool, through visual representation, amplification of issues and consideration of developed knowledge. Group scenarios during the design process, including those across multiple disciplines, could be facilitated by the sketch. Being depictive it could offer universality, (unlike spoken and written language), and could be used either alone or be supported by other such methods of communication.

Identification of micro processes was insightful and allowed for understanding of the cognitive activities within sketching: moves, arguments, vertical and lateral movements and the process of seeing and reflection identified actual mind activity at any point in time. The cognitive support sketching offered the short term (working) memory and its ability to convey visual imagery was also invaluable. The literature proved without a doubt that without the sketch, design ideation activity could be severely hampered.

The acquisition and maintenance of a sketching skill-set required it to be taught – it was not an intuitive activity, and as the literature on language suggested, it had to be learned and practiced. The ability to utilise sketching effectively required experience, quality of output affecting perception and standard of outcome: the better the sketch, the better the design. Sketching speed and its place in cognitive support was interesting - experience in its use allowed the brain to process it without self-consciousness, allowing thoughts to unfold. Without expertise, aesthetic of sketch output would be the prime consideration of the designer, not the thinking behind it,

again affecting design quality. Increased quantity of sketch output was also considered beneficial, helping prevent fixation and enabling effective apprehension of design knowledge.

The literature pertaining to design education identified many weaknesses around the teaching and learning of sketching. The largely positivist approach to HE appeared to be at odds with the complexity of design problems, thereby relegating creative subjects, and by default, sketching. The lack of consistent teaching between (and even within) FE and HE institutions, students often left to find their own way, with little success. Tutors, themselves without the drawing skills they needed, were unable to impart the required level of skill set within their students. The confusion and abrasion between fine art and design drawing often resulted in designers being taught only observational skills in a fine art tradition, a void where discipline-specific skills should exist.

Many educators appear unaware of the cognitive and micro-functional benefits of sketching during ideation, (these certainly not taught in studio sessions). Teaching time often leans towards imparting digital tools in preparation for employment, but the needs of employers are being failed by graduates having poor sketching ability. Digital tools appeared to have their place, and the development of sketching hardware could offer a useful hybrid between the clinical aesthetic of current software and the traditional sketchbook.

Expectation of students towards their HE experience has changed in recent years and continues to do so. Their affinity to the digital and intolerance of anything other than immediacy mean the persistence and dedication to a non-digital activity have become unfashionable. This could present an opportunity for a different approach to teaching and learning: one based on cognitive and micro-processes and the support they offer the designer during ideation. The isolated nature of the modular system also appeared problematic, enabling students to tick-off learning activities and move onto the next

without maintenance of learned skills – this would also suggest that embedding activities throughout courses needs to be more effective.

The literature also suggested that the 3d model could be considered as a sketch, and this needed to be further considered. Although not included within the definition of the sketch at the outset of the study, its benefits to design knowledge representation and concept development were in no doubt.

Although the literature fulfilled much of Phase I, (objectives 1-3), sketch inhibition was still largely an anomaly. The literature offered glimpses of its existence in the few papers that addressed it, together with some evidence of its types, cause, nature and effects. However, the data was limited and further research to a level of saturation was necessary. The primary research would therefore need to address specifically:

Objective 4: *the extent of sketch inhibition as a phenomenon and whether this is problematic to the design process,*

Objective 5: *the nature, common causal factors and effects of sketch inhibition among designers, and,*

Objective 6: *a pedagogic framework for design education.*

The proposed methodology for this, (including the reasons it had to be revised and redeveloped), are presented in the following; *Chapter 3: The Methodology.*

Chapter 3: The Methodology

3.1. Introduction

This chapter deals with the approach to data gathering and analysis in response to the objectives. As research rarely forms a tidy process, (this, a clear characteristic of the entire study), a linear route of methodology, data gathering and analysis did not happen, and the initial methodology was almost entirely scrapped. As such, the initial approach as presented for formal review is introduced, together with a critique of the proposed methods. The development of a more appropriate methodology is presented in depth, including an epistemological underpinning to the new approach which enabled a more robust and effective study.

3.2. The initial methodology

According to the requirements for PhD study, a research methodology had to be developed for formal review and was intended to provide the framework for the research - see figure 16 below. This was structured during the very early stage of the literature review.

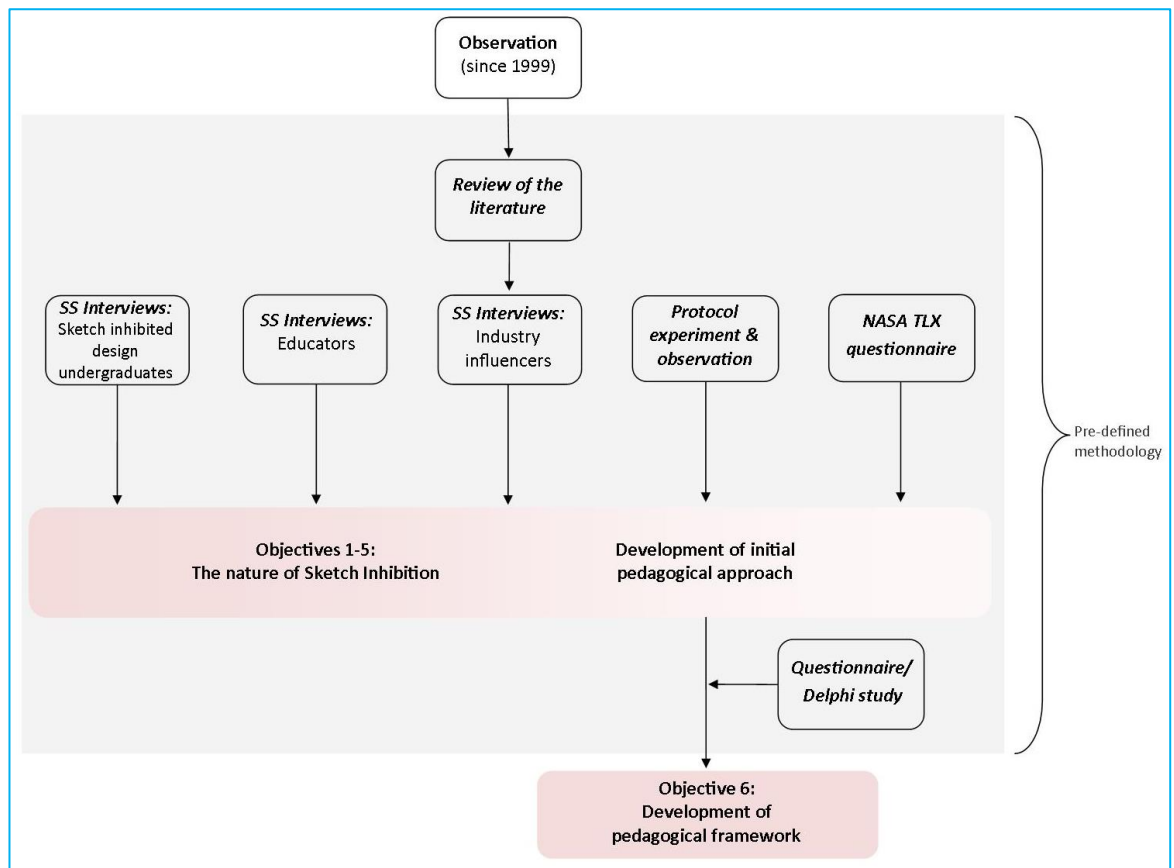


Figure 16: Initial methodology presented for formal review. Source: the author

The model demonstrated a very specific approach to the research, the formal review document presented the initial methodology thus:

“Identification of the three main areas of human interaction around sketching for design development; those of: undergraduate student...educator... and industry...”

“Semi-structured interviews... Type 1: industry and education specialists, i.e. those who observe the effects of sketch inhibition, Type 2: undergraduates of design, i.e. those who suffer with sketch inhibition.

“Protocol Analysis Experiment... to investigate the processes of designers during concept development.

“NASA TLX (self-report) and questionnaire: To be used post-protocol experiment to gather data relating to participants’ attitudes to the activity.

“Questionnaire/Delphi study: Once a proposal for a framework for sketch inhibition management had been developed, this would be presented for feedback along with the framework, to the participants of the interviews with education experts...”

3.3. The wrong methodology

As the literature review progressed and initial pilot interviews were conducted it became clear that parts of the proposed methodology were a poor fit for the proposal; inappropriate, (investigating the wrong issues or areas), and excessively pre-defined at such an early stage. As a result, issues emerging from the initial data would, due to the rigidity of the initial methodology, be unable to be addressed further. This would potentially leave a relevant area of investigation otherwise untouched and possibly resulting in an unreliable picture of sketch inhibition.

It became clear early on that Protocol Analysis Experiment would be pursuant of the wrong kind of data - the literature identified the use of such experiments among design students (Bilda at al. 2006, Bilda & Demirkan 2003, Cross 2001) to gain a picture of their processes during ideation, and the belief was, (erroneously), that this would reveal examples of sketch inhibition among sufferers. Such experiments also involved current and retrospective protocols also known as the *think aloud* method (Gero & Tang 2001) – the collection of verbal data from subjects to reflect their short-term memory processes during the act of mark-making. It became evident that this method was completely inappropriate: although able to identify the physical *processes* in the act of sketching, it would not allow exploration of the ‘soft’ human issues, or consider the cause and extent of the phenomenon which was at the root of the study, and was duly shelved.

The NASA TLX questionnaire, used after the protocol analysis experiment would, it was hoped, evidence the emotional aspects of sketch inhibition demonstrated by participants. Already used by Booth et al. (2015) as a self-report measure in their experiments with sketch inhibited students, it suggested that such individuals who engaged in sketching activities became less inhibited over a period of time. This was

useful as a measure of student response to activity and teaching effectiveness, (and would be of potential benefit once a pedagogic framework had been developed). However, it was inappropriate for gathering data concerning the cause and nature of inhibition: it would not provide depth and richness of data that the semi-structured interviews, (in pilot stage at the time), were returning.

The Delphi Study was initially considered as a means of containing and managing feedback about the proposed pedagogic framework, once it had been developed. According to Simon (2011), it would force new thought and enable individuals within the process to see how their peers had responded. However, early on, it was evident that a finalised framework would need to be tested within a studio environment in addition to seeking feedback from educators. A Delphi Study could damage this process by normalising thought too early. The notion, too, of participants seeing each other's feedback would be both unnecessary and possibly detrimental to the development of the framework.

Despite this, there were positive elements of the initial methodology. The intended sample groups for interview were maintained: educators, industry influencers and students from HE providing data regarding the nature, causes and subsequent effects of sketch inhibition. This would, according to Fusch & Ness (2015) offer a degree of triangulation and saturation as the research progressed, and endorsed the approach.

The initial semi-structured interview methodology was also proving effective, being *“suited for the exploration of the perceptions and opinions of respondents regarding complex and sometimes sensitive issues and enable probing for more information and clarification of answers,”* (Barriball & While 1994). Pilot interviews with subjects from all three groups early in the study, conducted between August and November 2016, using an initial framework of questions were proving successful. However, the data was suggesting the need for some changes to the protocol. According to Barriball & While (1994), the pilot stage would allow for identification of ambiguities, leading questions and those eliciting only binary answers. Gordon (1975) suggested listening to recordings of

interviews to identify where leading questions and “*subtle manifestations of the persuasive urge*” (p-) - a difficult temptation to resist – had affected the interview. In doing this, issues with the method were identified and addressed.

Standardisation of the question stimulus, according to (Smith 1975) was necessary so that “*any differences in the answers are due to differences among the respondents rather than in the questions asked,*” (Gordon 1975, p-). This would help mitigate the effect of variation in the understanding of vocabulary between individual participants (Treece & Treece, 1977) – what Denzin (1989) described as equivalence of meaning. As such, questions were redrafted as required in answer to these requirements. Additionally, the benefit of going *off piste* with questions was also considered: Hutchinson & Skodol Wilson (1992) observed that it could improve reliability of data by allowing a subject to clarify their responses and elaborate on pertinent issues, address sensitive issues and, according to Patton (1990) and Denzin (1989), increase rapport between interviewer and subject which could reduce the potential for giving socially desirable answers.

Interpersonal issues, previously not considered, were observed during the pilot interviews. The issue of rapport was considered important by Bailey (1987) who noted the characteristic effects of the interviewer on the subject: appearance, manner, age and education of the interviewer potentially affecting the subjects’ behaviour. The use of prompts was also considered. Leech (2002) described their benefit when a subject dried up: unscripted and either verbal or gestural, they encourage flow from the subject. Conversely, allowing the subject to talk uninterrupted was also a vital – if obvious – point: “*one of the most important rules about asking questions has to do with shutting up,*” (Leech 2002, p668).

Motivation of the subject was also an issue to consider: why would a subject want to bother answering a long set of questions if there was nothing in it for him? Oppenheim (2000) stated that the response rate and quality of data from interviews were the responsibility of the interviewer, and relied upon respondents’ motivation. Response rate was indeed an issue with the interviews, and evidenced in the relevant chapter.

With the establishment of the interview samples and the semi-structured interview method as being appropriate for the study, further investigation into appropriate research approaches had to be conducted. This, together with the methodology developed as a result, are presented below.

3.4. Back to basics: the potential epistemology

A lack of theoretical underpinning to the research was partly responsible for the problematic initial methodology, and so a clearer understanding of the ontology and epistemology from which the study was developed was necessary.

Understanding the nature of reality, truth, knowledge and theory proved beneficial, if a little overwhelming. All widely cited in research but semantically complex - and with the potential to affect the very foundations of the study - these were considered first with a view to developing a philosophical basis to the study. Howell (2013) introduced reality from positivist and phenomenological perspectives: positivism considering the world from a purely external context – one that is observable and exists separate from the individual, a continuum where there *“exists a correspondence between truth and reality,”* (p15). As with empiricism, positivism concentrates upon the rules and nature of external events. A phenomenological reality relies upon interpretations of reality that are intrinsic to the individual perceiving it – it relies on the mind for its existence, but is susceptible to its fallibility, being transitory in nature. Howell (2013): *“we only have access to reality through perceptual capabilities... the mind constructs an understanding of phenomenon... it’s not possible to say whether what we see is accurate,”* (p3). Schopenhauer (1966) described this as *realism* and *idealism*; a world existing both inside and outside the mind.

Debate about the perception of reality as it affected the study was of interest. Locke (1996) and Hume (2016) both suggested that all understanding originated externally and developed as a result of experience. By contrast, Kant (1992) argued that *“all objects of any experience possible to us are nothing but appearances that are mere representations ... (they) ... have no independent existence outside our thoughts,”* (p519). He believed that

“occurrences and events are initially phenomenon of the brain and made up of subjective conditions,” (Kant from Schopenhauer, 1966, p3).

Despite its rational approach, Kant (1992) identified a problematic with the purity of empirical evidence: *“Knowledge begins with experience... it may well be that even our empirical knowledge is made up of what we receive through impressions and of what our own faculty of knowledge... supplies from itself,”* (p41-2). Polkinghorne (1989) posited that empiricism, with its reliance on observation and experience, considered the human consciousness to be inaccessible to science and as a result, unreliable. Thus, an empirical approach to the study would still incur potential inaccuracy – this being completely unavoidable.

Howell (2013) noted the inseparability of the world and the researcher: *“research involves the relationship between the individual undertaking the investigation and the environment being researched,”* (p13). He believed that problem-identification and development of research strategy could not be objective: *“one takes self to... self-defined perceptions of the problem (and) the questions self will ask. The process... involves the researcher recognising both subjective and objective tendencies in developing research strategies,”* (p7).

Although not a phenomenological study, approaching this research as an individual with a-priori experiences of the world in which it is to be conducted would suggest a purely positivist approach is impossible. Howell (2013): *“when we undertake a research project we approach the world with preconceptions about the relationship between mind and external reality,”* (p4). Unavoidably, it would appear, *“the starting point is the subjective self... the real world is phenomenon of the mind”* (ibid).

The concepts of truth and knowledge appeared equally nebulous. Rorty (2009) believed that truth could be merely the endorsement of a given statement and an impossibility to achieve. Howell (2013) suggested truth comprised reflections of reality, relying on both evidence and an understanding of the nature of reality. He stated that a

truth could not be eternal; it could only exist at a given point in time, and like theories, could change and in doing so alter the nature of perceived reality. A combination of reality, truth and theories developed from them enable a body of knowledge to be created. Problematically, for the study, interpretation of information would lead to perceptions and beliefs about reality being imparted: it could never be a truly positivist piece of work, but a representational interpretation of the truths of those involved.

The lack of data surrounding sketch inhibition suggested, early on, that only minimal theory existed. This suggested the benefit of an inductive strategy, however, the distinction between deductive and inductive (theory testing) methods were not as clear cut as initially thought. Marshall, (from Coase 1995), noted that *“each involves the other... historians are always deducing, and even the most deductive writers are always implicitly... basing themselves on observed facts,”* (p169). Howell (2013) also observed,

“no one is able to enter the field with no preconceptions and hypotheses generated through some understanding of the subject, consequently a continuum exists with variable levels of synthesis between deductive and inductive approaches,” (p43).

It became apparent that an inductive (as best as it could be applied) and theory-building approach could provide a good fit and such a constructivist methodology appeared to be most plausible. Howell (2013):

“no external objective reality or system exists: knowledge, truth, reality and theory are considered contingent and based on human perception and experience,” (p27)
“...researcher and research continually interact and influence one another,” (p90)

– this appeared to comfortably define the epistemological approach to the study.

The development of a theory of sketch inhibition became a tenet of the study:

“explaining or giving meaning to understandings extrapolated from data,” (Howell 2013, p2). According to Evans et al. (2011), theory benefits the researcher by enabling him to *“think through most stages of the research process, particularly designing and planning a study, and gathering and analysing and interpreting data,”* (p276) – the development of an epistemological basis to the study indeed evidencing this. Theory is dynamic, never

static (Corvellec 2013), this comfortably according with notions of truth already discussed. Therefore, development of a theory of sketch inhibition would only provide the debate with a proposition – a contemporary snapshot of the phenomenon.

The nature and purpose of theory were considered, Howell (2013) describing it as something that *“produces choice, creates alternative scenarios, formulates debate on communication, increases awareness and develops understanding,”* (p21). Wacker (1998) noted its importance for providing *“a framework for analysis... an efficient method for field development and... clear explanations for the pragmatic world,”* (p362). Dubin (1969) identified the five specific requirements for a theory, it: should enable prediction or increased understanding, be interesting, refer to interactions between variables, not include composite variables, and have boundary criteria - according to Naumann, (1984), any conceptual model that fails to meet all five criteria remains a *framework*.

The most purposeful benefit of developing a theory of sketch inhibition was described by Strauss & Corbin (1990) as, *“a set of well-developed concepts related through statements of relationship, which together constitute an integrated framework that can be used to explain or predict phenomena,”* (p15) – something the study hoped to achieve.

3.5. An observation of design epistemology

“Designers don’t read, so designers don’t write” according to Kalman et al. (1991) and the lack of a formal specifically design-owned ontology was apparent prior to and throughout the study. A tradition of borrowing from the social sciences appeared to be the norm, Doherty (2015) stating that a PhD in design was essentially one of social science.

Of design ontology, Downs (2017) noted *“there are a great many...propositional statements about everything from education to practice, and there are very few evidentiary statements.”* Similarly, Crismond & Adams (2012) observed that teachers with *“considerable disciplinary and experiential knowledge, rarely read design research or disseminate their effective design teaching approaches to others,”* (p740). Downs (2017) described Tversky’s

(1997, 1999, 2002, 2003) formal psychological work into design practice proved the cognitive necessity for activities previously described as merely *good practice*. He cited his own experience:

“I was told that you needed to work through your ideas on paper but (it was) never explained why this is a good thing... I was told it was just a virtuous thing to do. Tversky’s work actually evidences that different part of the brain operating... in response to... making shapes on paper.”

Similarly, Ashwin (1984) bemoaned the lack of writing about drawing *“the essential nature of drawing remain(s) strangely elusive and extraordinarily difficult to talk about,”* (p42). He suggested the development of a relevant drawing theory could be logically based upon semiology. Identifying the equivalences between drawing and language, their referential, emotive and phatic qualities being ideally suited, he believed, to a semiotic approach, and one based within structuralism – again relying on other disciplines for theoretical underpinning.

3.6. A qualitative approach

From the outset, it was evident that a qualitative approach would be required for the study. Flick et al. (2004) described characteristics of this paradigm, many of which were identified as pertinent to the proposed study - particularly the close relationship between the approach and everyday events or knowledge, and the importance of the perspectives of individual participants. Discovery and theory formation were a prime goal of the process and it would enable understanding of social realities by closely observing patterns, processes and features - an ideal standpoint from which to conduct the investigation. Eliciting *thick* descriptions and precision of data - making the *“unknown perceptible in the known,”* (p3) - it would be an ideal approach to investigating the phenomenon.

Cresswell (2003) noted the emergent nature of qualitative research, as opposed to being *“tightly prefigured,”* (p181) - this requiring a need for reflectiveness in approach by the researcher, (according to Flick et al. 2004). The very nature of qualitative studies being

interpretive, according to Cresswell (2003), brought its own issues. Mertens (2003) described the traits of an effective qualitative researcher, such qualities to be borne in mind throughout the study, requiring awareness of one's own persona, including bias and agenda, and awareness of the intrinsic value-laden nature of research with its inseparability from the self. Cresswell (2003) also described the difficulty of separating the self from qualitative research, again, making a truly positivist study impossible: *"the researcher filters the data through a personal lens that is situated in a specific socio-political and historical moment. One cannot escape the personal interpretation brought to qualitative data analysis,"* (p182),

Cresswell (2003) also described issues that had not been considered until this point but which provided underpinning for the whole study: *"the research questions may change and be refined as the inquirer learns what to ask and to whom it should be asked... (and the)... data collection process might change as doors open and close,"* (p181). Also, *"an unfolding research model make(s) it difficult to prefigure qualitative research tightly at the proposal... stage,"* Cresswell (2003, p182) – this also offered an additional explanation as to why the initial methodology may have been unsuccessful.

3.7. The potential research strategies

Under the umbrella of a qualitative strategy, several research approaches were considered during the development of the final methodology. An evaluation of methods was conducted via the literature, and their appropriateness for research into sketch inhibition considered. Creswell (2003) identified five broad traditions within qualitative research, of which Phenomenology and Grounded Theory appeared potentially appropriate, and endorsed by Starks & Trinidad (2007): *"in a phenomenological or grounded theory study the objective... is to elicit the participant's story,"* (p1375). Additionally, Thematic Analysis appeared to offer a good fit for evaluation of the data and this was also explored. The qualities of these approaches, as they would benefit the study, are considered below.

3.7.1. *Phenomenology*

Sketch inhibition being a *phenomenon* led to the initial assumption that a phenomenological strategy would be appropriate for its investigation. The human issues identified during the literature review and pilot interviews also supported the notion that giving voice and making sense of the experiences of participants, (Larkin & Thompson 2011); focussing on their meaning and significance, rather than their process and cause, (Smith & Osborn 2003) would be valid. Baker et al. (1992) endorsed the method for describing the experience of participants, establish commonalities and identify variations using via a process of reduction.

Phenomenology, developed by Husserl during the early twentieth century, lies within the tradition of philosophy, and aims to establish and describe the psychological realities of lived experiences according to those experiencing them (Baker et al. 1992). Larkin & Thompson (2011) referred to "*meaning and processes, rather than... events and their cause*" (p102). Baker et al. (1992) referred to the need for reflection and to observe, suspending all prior knowledge, beliefs and theories, resulting in understanding the nature of the issue, "*in great detail*" (Braun & Clarke 2006, p8). These initial qualities identified in the literature made the approach one of interest.

Of specific interest was Interpretive Phenomenological Analysis (IPA) based on the approach of both Heidegger (Wojnar & Swanson 2007), and Merleau-Ponty (Merleau-Ponty 2013). They both acknowledged the existence of human experience within a wider environment - "*being-in-the-world*'... and not *'bracketed'* from it" (Wimpenny & Gass 2000, p1490), unlike Husserl's more transcendent, reductionist approach: "*IPA has a commitment to an idiographic level of analysis which implies a focus on the particular, rather than the general... phenomenological inquiry is a situated enterprise,*" (Larkin & Thompson 2011, p102). According to Smith & Osborn (2003), "*there is no single, definitive way to do IPA,*" (p54) however, investigating with flexibility and attention to detail was cited as necessary to build understanding.

IPA's specific qualities would enable, according to Smith & Osborn (2003), the asking of critical questions of participants, which could further enrich the data – this would inform a thick description (Geertz 1973) of sketch inhibition in answer to the research objectives. Baker et al. (1992) stated that the only source of relevant data when conducting such an investigation is that of the participant – “*informants who have lived the reality being investigated,*” (Geertz 1973, p1357). Borrowing of experience to understand the experiences of other is considered by Van Manen (1984): the *borrowing elicited*, in the case of this study, from the participants interview material.

Smith & Osborne (2003) endorsed the use of semi-structured interviews as the best method for data collection using IPA.; Wimpenny & Gass, (2000) also suggested this is the predominant method in phenomenology – and already identified as the most appropriate for data collection during the study - Starks & Trinidad (2007) also endorsed focus groups and use of textual data. Purposive sampling was suggested by Baker et al. (1992) and Starks & Trinidad (2007) as the best method to access appropriate subjects. Smith & Osborn (2003), also suggested data collection include recording of nuanced and gestural information as this can contain meaning beyond the verbal.

The benefits to the research of using IPA included the depth to which a participant's experience could be examined, linking speech, emotion, and thinking to develop understanding. However, Smith & Osborne (2003) illustrated the difficulties of using IPA, citing participants' reluctance to disclose, inability to express themselves and the researcher's role of interpreting the data that is acquired by the method. The literature, having highlighted cognition as an important factor in understanding the processes of sketching led to the assumption that IPA would enable expansion of these issues. Sharing a commonality of approach with social and clinical psychology in the analysis of cognitive issues, (according to Fiske & Taylor, 1991), those relating to sketching and ultimately sketch inhibition could be addressed using this method.

On data analysis using IPA (as opposed to the Husserlian approach), unavoidable

researcher influence was considered. Larkin & Thompson (2011) endorsed the need to maintain a pragmatic stance without projecting onto the data as important in reaching accurate conclusions using IPA. By contrast, Smith & Osborn (2003) stated: *“the researcher’s own conceptions... are required in order to make sense of that other personal world through a process of interpretative activity,”* (p53). They described a double hermeneutic within the process of analysis: *“the participants are trying to make sense of their world; the researcher is trying to make sense of the participants trying to make sense of their world,”* (ibid), suggesting the degree to which researcher influence may affect the outcome of the process. The majority of references appear to favour a thematic approach to analysis. Smith & Osborn (2003) suggested no need for the deconstruction of data: *“there is no requirement... to divide the text into meaning units and assign a comment for each unit. Some parts of the interview will be richer than others and so warrant more commentary,”* (p67). Larkin & Thompson, (2011) referred to interpretation and summarising of data and allowing these initial codes to be traced through the analysis and developed into final themes.

3.7.2. *Grounded Theory*

In developing this approach, Glaser and Strauss’s (1967) method, based on an induction, considered that interpretations of reality were dependent upon the observers, whose collective consensus would form interpretations and offering a compromise between empiricism and relativism (Suddaby 2006). Suddaby (2006) and Muratovski (2016) suggested that Grounded Theory is best used when researchers seek to understand and explain a phenomenon where little theory exists, it *“relies on the absence of an existing theory and its purpose is to set up a new theory”* (Muratovski 2016, p99) and is used to explain the realities of social or psycho-social situations (Baker et al. 1992). Theory derived from such activity is, according to Borgatti, (n.d.) developed inductively and aims to *“focus on making implicit belief systems explicit”* (p-).

The result of such a study should provide, *“a statement, visual model, or a series of hypotheses, and should depict the evolving nature of the process and describe how certain*

conditions lead to certain actions or interactions" (Muratovski 2016, p99, from Leedy and Ormrod, 2010). Furniss et al. (2011) described the extent of such theory at its most developed being, *"a full conceptual system, but at lower levels of development will also include basic taxonomy development, focused conceptual development and cycles of interpretation,"* (p-). Bohm (2004) also stated that Grounded Theory could be used to refer to both *method* and *result* of this approach to research.

One particular feature of the approach is that analysis of data is conducted as it is collected, rather than generating an entire body of data before beginning. Classification of data is done using an emergent approach, allowing the data to saturate categories, to identify disconfirming evidence and new categories and offers a data-driven approach (Muratovski 2016).

The two approaches to Grounded Theory, (Glaserian and Straussian) share core tenets of *constant comparison* and *theoretical sampling*. These two principal characteristics of the method were identified for their relevance to this study: *constant comparison* of the data with emerging categories, and *theoretical sampling* to identify further sources of data, relative to the emerging theory derived from it (Suddaby 2006). On *constant comparison*, Locke (1996) observed that as data is categorised, or coded, it is automatically compared with other examples within that category, allowing for challenging of its content and its subsequent growth. Simultaneously, this process identifies areas for further investigation, thereby broadening the research, via the process of theoretical sampling – data is not only *"compared and contrasted during data collection and analysis but also that the materialising theory drives ongoing data collection"* (Locke 1996, p240).

Locke cited the *"recursive, process-oriented, analytic procedure"* (ibid) of the method as its key benefit: *"most hypotheses and concepts not only come from the data, but are systematically worked out in relation to the data during the course of the research"* (Glaser & Strauss 1967, p6). *"Categories or codes... are the basic building blocks of a grounded theory. As they are developed, the same recursive, theory driven, comparative processes are used to surface the links and relationships among the categories to construct a complete theoretical framework"* (Locke

1996, p241) Such a data-driven, inductive approach towards research appeared to offer a resilient and justifiable route towards development of a potential theory of sketch inhibition.

The separation of Grounded Theory's initial paradigm into two separate schools in 1990 according to Strauss & Corbin's '*Basics of Qualitative Research*' presented further opportunity to examine their individual benefits to the study. The initial Glaserian model, (Glaser & Strauss 1967), according to Locke (1996), was "to encourage researchers to use their intellectual imagination and creativity to develop theories related to the areas of enquiry," (p239) through the gathering of naturalistic data. Glaser maintained that Strauss & Corbin's revised approach would only serve to "force conceptual descriptions" instead of allowing the development of "grand theories"(Glaser 1992, p8). However, Borgatti (n.d.) suggests that the Straussian model "consists of a set of steps whose careful execution is thought to guarantee a good theory as the outcome," (p-). Locke (1996) considered the benefits of *emergence* versus *forcing* of the data. She stated that the original Glaserian model favoured the passive, neutral approach of the researcher, avoiding the intrusion of pre-conception and allowing for a "one-way mirror" (p241) on the world: "categories emerge upon comparison and properties emerge upon more comparison. And that is all there is to it" (Glaser 1992, p43). In contrast, Strauss & Corbin's (1990) model suggest the application of questions - interrogation and provocation of the data – as necessary to develop good theory. At this point, Strauss and Corbin (1998) observed that both induction and *deduction* played their part in Grounded Theory research. The conceptualisation of data by researcher could not avoid the latter, and suggested interplay between the two was necessary for effective theory-building.

In Grounded Theory, Walker & Myrick 2006 suggested that coding, "is what transports researchers and their data from transcript to theory," (p549). They noted that both schools have the same basic functions within their approach: "gather data, code, compare, categorize, theoretically sample, develop a core category, and generate a theory" (p550). Baker et al. (1992), noted that the psycho-social and social process of importance to Grounded Theory research come from observation, listening to participants, is inferred from

literature and from thinking about one's own experiences: they believed that *everything* could be considered data within a Grounded Theory study.

Glaser's (1978) approach to coding involved "*fracturing the data, then conceptually grouping it into codes that then become the theory which explains what is happening in the data*" (p55). He used two separate processes: substantive coding, which involved breaking the data into individual categories based upon its properties, and further selective, or theoretical coding at the conceptual level develop theory (Walker & Myrick 2006). Strauss & Corbin's (1990), coding is divided into three levels: *open*, *axial* and *selective* coding, although they admit the lines between these three stages are subject to blurring and as such can be utilised sequentially or concurrently (Walker & Myrick 2006). *Open* coding allows the researcher to reduce the data to a manageable, concise set of themes that accurately reflect the phenomenon. *Axial* coding allows for interpretation of categories to be identified. Muratovski (2016) refers to Leedy & Ormrod's examples of questioning the data to develop *axial* coding: "*What are the conditions that have given rise to this process? What is the context in which this process is embedded?... What are the consequences of these strategies?*" (Leedy & Ormrod 2010, p143). Muratovski (2016) illustrated the *selective* coding level: "*the categories and their interconnections will need to be combined to form a storyline that describes the mechanics of this process. This then leads to the development of a theory,*" (p100). (Coding types are illustrated in section 3.8: *The proposed methodology*).

According to Locke (1996), Glaser believed that Strauss & Corbin's (1990) approach to coding was aggressive and negatively affected the outcome of research: "*Strauss' sampling is controlled by the evolving relevant concepts, and relevance comes from testing out what is looked for, not what is emerging*" (Glaser, 1992, p103), leading to contamination of analysis and anticipation of the data rather than natural emergence. A further issue between the two schools appeared to be their respective attitudes towards the researcher's *a priori* experience of the issues of study and the acceptability of the literature. Strauss and Corbin (1990) believed the previous exposure of the researcher to the issues under scrutiny offered insight. They also believed engagement with

relevant literature to be insightful. Glaser refuted this, suggesting it contaminated the process: *"the analyst should just not know as he approaches the data"* (Glaser 1992, p50), believing that the stifling of researcher's activity through previous knowledge was detrimental to effective theorising. Suddaby (2006) considered the negation of literature, previous experience and personal agenda as impossible and based upon the false premise that, *"the researcher is a blank sheet devoid of experience or knowledge"* (p634) – virtually unattainable in any research scenario. He suggested Grounded Theory should offer *"a practical middle ground between a theory-laden view of the world and an unfettered empiricism,"* (p635). Figure 17 below, contrasts the Glaserian and Straussian approaches.

'GLASERIAN'	'STRAUSSIAN'
Beginning with general wonderment (an empty mind)	Having a general idea of where to begin
Emerging theory, with neutral questions	Forcing the theory, with structured questions
Development of a conceptual theory	Conceptual description (description of situations)
Theoretical sensitivity (the ability to perceive variables and relationships) comes from immersion in the data	Theoretical sensitivity comes from methods and Tools
The theory is grounded in the data	The theory is interpreted by an observer
The credibility of the theory, or verification, is derived from its grounding in the data	The credibility of the theory comes from the rigour of the method
A basic social process should be identified	Basic social processes need not be identified
The researcher is passive, exhibiting disciplined restraint	The researcher is active
Data reveals the theory	Data is structured to reveal the theory
Coding is less rigorous, a constant comparison of incident to incident, with neutral questions and categories and properties evolving. Take care not to 'over-conceptualise', identify key points	Coding is more rigorous and defined by technique. The nature of making comparisons varies with the coding technique. Labels are carefully crafted at the time. Codes are derived from 'micro-analysis which consists of analysis data word-by-word'
Two coding phases or types, simple (fracture the data then conceptually group it) and substantive (open or selective, to produce categories and properties)	Three types of coding, open (identifying, naming, categorising and describing phenomena), axial (the process of relating codes to each other) and selective (choosing a core category and relating other categories to that)
Regarded by some as the only 'true' GTM	Regarded by some as a form of qualitative data analysis (QDA)

Figure 17: Comparison of the Glaserian and Straussian approaches to Grounded Theory. Source: Jones, 2011

Having conducted an extensive literature review together with using data from previous studio teaching sessions (as presented in the introduction), would suggest that the research has already been, if the Glaserian model is to be observed, contaminated. However, the Straussian approach would mitigate this - it being impossible to present to the study without any *a priori* experience of the issues. This more structured approach could be simpler to manage and make it easier to identify when objectives had/had not been achieved. Additionally, a lack of experience in conducting Grounded Theory research and limitations of timeframe suggested that the Straussian approach would be preferable.

3.7.3. *Thematic analysis*

As a method for analysis, its ability to “*summarise key features of a large body of data... offer thick description... generate unanticipated insights... allow for social, psychological interpretations... (and) useful for... informing policy development,*” (Braun & Clarke 2006, p37), Thematic Analysis offered a potential good fit with the aim and objectives of the research and the type of data it was likely to generate. According to Braun & Clarke (2006), being inductive and data-driven, it does not attempt to fit any pre-defined coding framework or pre-conceptions on the part of the researcher. This would be potentially useful for the issues of sketch inhibition; identifying themes to enable understanding of the phenomenon (Fereday & Muir-Cochrane 2006), and develop a framework for its management. In addition, and of particular interest to the study, it “*is not wed to any pre-existing theoretical framework, and so it can be used within different theoretical frameworks,*” (p9).

Thematic Analysis appeared to be widely-used analytical tool within social science, albeit one lacking specific definition, theory and protocol, Braun and Clarke (2006) maintaining “*there is no clear agreement about what thematic analysis is and how you go about doing it,*” (p6). Disagreement concerning its application could bring into question its rigour as a tool for analysis: Ryan & Bernard (2000) consider it a valid method within other research paradigms including Grounded Theory. However, Braun &

Clarke (2006) observe that *“a ‘named-and-claimed’ thematic analysis means researchers need not subscribe to the implicit theoretical commitments of grounded theory if they do not wish to produce a fully worked-up grounded-theory analysis”* (p8). Interestingly, neither Glaser & Strauss (1967) nor Strauss & Corbin (1990) have never referred to thematic analysis in their versions of Grounded Theory.

The identification of themes appeared to be a simple yet subjective process within thematic analysis: Rowley (2012) stated that the purpose was to identify and link key themes in order to develop a narrative, the aim being to generate meaning. Braun & Clarke (2006) noting; *“there is no hard-and-fast answer to the question of what proportion of your data set needs to display evidence of the theme for it to be considered a theme,”* (p10). They also suggested that the quantifiable instances of a theme in a data set do not necessarily correlate with its importance as a theme: *“there is no right or wrong method for determining prevalence,”* (p11).

The researcher’s own judgement, flexibility and the need for analysis to *“capture something important”* (p10), about the data - the *something* being unspecified – were cited by Braun & Clarke (2006), as the basis of thematic analysis, as was the need to *“determine themes,”* (p11), again, without specifics as to how to approach this. Boyatzis (1998) described a theme as *“a pattern in the information that at minimum describes and organises the possible observations and at maximum interprets aspects of the phenomenon”* (p161). Divergence and disagreement within the data should, according to Rowley (2012), be embraced.

Braun & Clarke (2006) considered the coding of interview transcripts which may be approached in several ways, including generalised coding into as many nodes as possible to identify the breadth of themes. More specific coding would consider specific parts of a transcript, and coding into multiple nodes where and when the data appears to relate to more than one theme. Additionally, Fereday & Muir-Cochrane (2006) suggested the development of further codes separate to, or developed from, pre-existing codes. Rapid Identification of Themes from Audio-recordings (RITA), (Neal et

al. 2014) was a possible method to extract data from interviews without the need for transcription, however its method relied upon analysis of time-based sections of data to identify and quantify pre-defined themes. Thematic frequency was not considered to be of particular value to the study: a single incidence of a theme would be enough to justify it as of thematic importance, and so RITA was rejected.

Braun & Clarke (2006) suggested, "*the themes you identify, code, and analyse would need to be an accurate reflection of the content of the entire data set,*" (p11). They also considered the identification of semantic or descriptive data and its development into latent or interpretive information: "*the semantic approach would seek to describe the surface of the jelly, its form and meaning, while the latent approach would seek identify the features that gave it that particular form and meaning,*" (p13) – these being of possible benefit to the study. The inductive, data driven and malleable, (albeit imprecise) qualities that thematic analysis offered made it a potentially ideal tool for examining the under-researched issues of sketch inhibition.

3.7.4. *A comparative analysis of the proposed approaches*

Anells (2006) believed best practice could be achieved using Phenomenology and Grounded Theory together: they could offer useful insights and enable a prism-turning effect on research, effectively triangulating the data to gain understanding of both the social and experiential aspects. A decision about the priority of issues was required: this would establish the most imperative needs of the study whilst being mindful of timeframe.

According to Baker et al. (1992), there is a general tendency for research within the social sciences to demonstrate method slurring, caused by application of *ad lib* methodologies that lack evidence of a clear paradigm, bringing into question the rigour of such research. Specifically, and of concern to the study: "*grounded theory and phenomenology appear to be particularly susceptible to the blurring trend... it is not uncommon for an investigator to purport to use one or the other while in fact combining*

elements of each," (Baker et al. 1992, p1355). As such the study would need to be mindful of method slurring, (as far as was practicable), and be based upon a clear paradigm.

Baker et al.'s (1992) definitions of the two methods helped clarify their differences:

"Phenomenology... is designed to describe psychological realities by uncovering the essential meaning of lived experience. In contrast, grounded theory... social or social psychological realities by identifying processes at work in the situation being investigated," (p1357). Both of these approaches seemed valuable. Baker et al.'s (1992) notion of the researcher suspending all previous beliefs about the phenomenon in question suggested a problem for the study – a priori knowledge was so embedded already, during the course of proposal development and formal review submission, that an uncontaminated phenomenological approach would be impossible. In contrast, with a Grounded Theory approach, *"previous experiences are data... the researcher uses these in order to understand better the processes being observed,"* (Baker et al. 1992, p1357) - this was clearly emerging as the more appropriate strategy.

The potential for a phenomenological approach to the study, (according to Gravelle 1997), relying predominantly on interviewing, could prematurely foreshorten the research process. A Grounded Theory approach, with its openness to multiple data collection methods could offer greater serendipity, (according to Wimpenny & Gass, 2000) allowing for unforeseen issues to be investigated as they arise: this appeared to be the more fitting of the two approaches.

Although both Phenomenology and Grounded Theory both utilise in-depth interviewing, Wimpenny & Gass (2000) note the divergence of method as research progresses. With Phenomenology, the sample is deliberately small, (according to Baker et al. 1992), and questioning tends to remain consistent, producing a static body of data. Grounded Theory, with its reliance upon concurrent analysis and purposive sampling, requires the researcher to develop the questioning, identify useful subjects and access additional methods to explore emerging issues (Wimpenny & Gass 2000). The latter, again would appear most appropriate for the study. In addition to the

above, the following table (see figure 18), based on Starks & Trinidad (2007) was used as a decision-making tool, to model the comparisons between Grounded Theory and Phenomenology as they referred to the study.

	Phenomenology	Grounded Theory
HISTORY:	European philosophy	Sociology
PHILOSOPHY:	There exists an essential, perceived reality with common features	Theory is discovered by examining concepts grounded in the data
GOAL:	Describe the meaning of the lived experience of a phenomena	Develop an explanatory theory of basic social processes
METHODOLOGY: Formulating a research question	“What is the lived experience of [<i>the lived phenomenon of interest?</i>]”	“How does the basic social process of [X] happen in the context of [Y] environment?”
Sampling	Those who have experienced the phenomenon of interest	Those who have experienced the phenomenon under different conditions
DATA COLLECTION: Observations	Observe participants in the context where the phenomenon is experienced	Observe participants where the basic social process takes place
Interviewing strategy	Participant describes experience; interviewer probes for detail, clarity	Participant describes experience; interviewer probes for detail, clarity
ANALYTIC METHODS: Decontextualisation & recontextualisation Process of coding, sorting, identifying themes and relationships and drawing conclusions	Identify descriptions of the phenomenon; cluster into discrete categories; taken together, these describe the “essence” or core commonality of the experience	Open, axial and selective coding. Examine concepts across their properties and dimensions; develop an explanatory framework that integrates the core concepts into categories
Role of analyst’s views	Bracket views	Bracket views
AUDIENCE:	Clinicians, practitioners and others who need to understand the lived experience of the phenomenon of interest	Researchers and practitioners who seek explanatory models upon which to design interventions
PRODUCT:	A thematic description of the pre-given “essences” and structures of lived experiences	Generate theory from the range of participants experience

Key:

Of high importance:

Of low importance:

Figure 18: Methodology decision-making tool. Source: Based upon Starks & Trinidad, 2007.

This model was considered with respect to the aim and objectives of the study – and the features of each approach acknowledged. Features of high importance have been highlighted. However, with particular reference to *audience* and *product*, Grounded Theory would enable the development of a theory of sketch inhibition together with a pedagogic framework.

Thematic analysis was clearly a credible method for data analysis. However, comparison with the Straussian approach to Grounded Theory suggested that the three-stage process of coding of the latter method (described in the proposed methodology) would also identify themes, (regardless of frequency). Being more agile and reflexive than a thematic analysis of static data, it would more easily enable development of a theory of sketch inhibition. Based upon this, a new methodology was developed and is described below.

3.8. The proposed methodology

Based upon the above considerations, the new methodology would have to develop as a result of *constant comparison*, and could not, according to a purist Grounded Theory approach, be prescribed. However, the two elements of the initial methodology that already proved successful - the literature review and pilot semi-structured interviews - were built upon. At this stage, the additional methods had not been identified, but for clarity are presented in figure 19, below and described in this chapter.

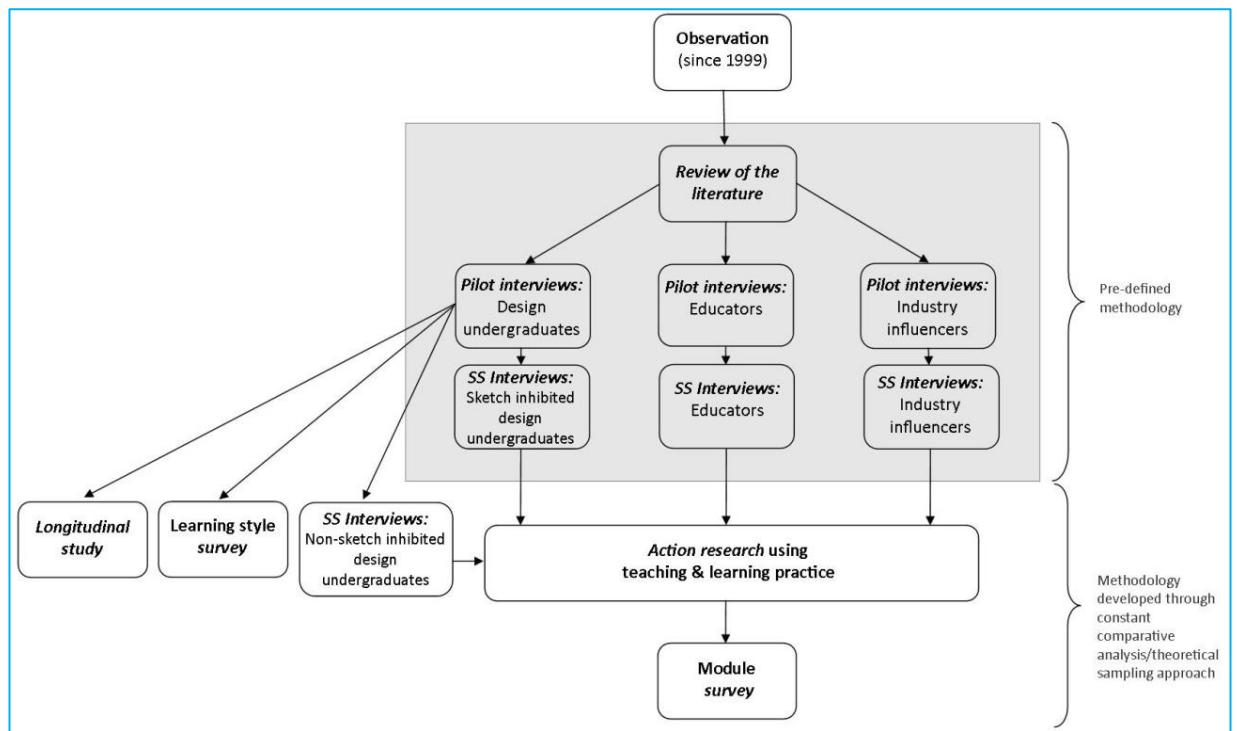


Figure 19: The proposed methodology using a Grounded Theory approach. Source: the author.

3.9. The semi-structured interviews

3.9.1. The questions

These were developed as a result of asking, ‘*what do I need to know about sketch inhibition?*’ from each of the groups. A list of the issues required was compiled, (see Appendix 3), and from this, open-ended questions structured. Equivalence of meaning when interviewing (Barriball & While 1994), was acknowledged. The resulting questions acted as an aide memoire – a checklist of the areas the subject would be asked to talk about, (see Appendix 4). This less formal questioning technique also enabled exploration of emerging issues.

3.9.2. *Sample size & saturation*

This was the most problematic aspect of managing the interviews, and one revisited constantly during the study. Guest et al. (2006) bemoaned the literature, *“did a poor job of operationalizing the concept of saturation, providing no description of how saturation might be determined and no practical guidelines for estimating sample sizes for purposively sampled interviews,”* (p60) – an issue encountered constantly. Smith & Osborn (2003) maintained there was simply no right answer to sample size, referring to the *“level of analysis and reporting, the richness of the individual cases, and the constraints one is operating under,”* (p56) as factors. They also observed that being overwhelmed by a large volume of data could prevent effective analysis of the depth of issues.

Morse (1995) described saturation within qualitative studies as the point at which no more new data emerged – or where indeed boredom was setting in. Starks & Trinidad (2007) stated the importance of *“recruiting participants with differing experiences of the phenomenon so as to explore multiple dimensions of the social processes under study. The researcher continues to add individuals to the sample until she reaches theoretical saturation; that is, when the complete range of constructs that make up the theory is fully represented by the data,”* (p1375). Despite this, Guest et al. (2006) maintain that Grounded Theory studies in particular can be limitless in terms of their saturation point - although saturation is a conceptually clear entity, it can prove problematic to identify during the research process. Smith & Osborn (2003) also observed the willingness of individuals to participate would affect sample size - an issue that became apparent during data collection.

3.9.3. *Recruiting the subjects*

Subjects were duly recruited for interview. This was an ongoing process: sample sizes were not pre-defined and reliant entirely on data saturation. Sixteen educators were interviewed, their recruitment based upon three factors: their expertise as design educators, their significant expertise of sketch inhibition among their students and their ability to partake. Additionally, several subjects who authored papers accessed

during the literature review and to whom the above criteria applied were also recruited. It was considered that interviewing would gather additional data beyond that which had already been published and this could be of benefit to the study. The sample was recruited from as wide a range of disciplines as practical. Additionally, subjects regularly performed teaching as part of their individual roles within their respective institutions; these ranging from lecturer, module or course leader, to subject or department head. Two of the subjects came from outside the UK, (the US and Canada), but their input was deemed crucial as their research into sketch inhibition had been published and formed the basis for this study. All subjects were approached either personally or by email, the study explained to them, and their participation requested.

The industry sample was structured from individuals identified as influential or highly experienced in their discipline. These included individuals already known through practice, those who were sought specifically for their experience and others recommended by supervisors for their potential benefits to the study. Subjects came from architecture, interior, digital media, fashion, engineering, museum, product, exhibition and retail design. A total of twelve subjects constituted the sample.

The student sample was recruited from several design disciplines – the discipline non-specific approaches of Cross (2001) and Stones & Cassidy (2010) observed to allow breadth of data. The disciplines were: architecture, interior, product and fashion design within the Faculty of Art, Design & Humanities at De Montfort University, and games design & animation within the Faculty of Technology at the same institution.

Subjects were recruited by course leaders who were briefed to provide sketch inhibited students. Third year (level 6) undergraduates were sought – the rationale being that they would have received nearly three years of design higher education, so would have greater experience to draw upon than their peers in lower years. Subjects were told that they would be taking part in an interview about their design processes as part of a PhD research project but were not enlightened as to their selection on the basis of

being inhibited or fluent. (It could be argued that this approach was problematic: the perception of sketch inhibition among recruiting tutors being different to that driving the research).

During the pilot interviews, a sketch fluent subject was interviewed – the data from this suggested a contrast between fluent and inhibited subjects that warranted further investigation, (according to the Grounded Theory approach being used). A further sample of sketch fluent subjects was acquired to act as a control group. The entire sample constituted seventeen students: eleven sketch inhibited, six sketch fluent.

A written description of the study together with a consent form for approval was provided to all subjects prior to interviews. (All documents for this purpose were approved by the De Montfort University Ethics Committee during March 2016 and are contained in Appendix 5).

3.9.4. *The process*

Interviews took place between March 2017 and May 2018, conducted at De Montfort University, at the subject's place of work or home, or via skype where accessibility was problematic. Questions were asked in a loose, unstructured way, in accordance with the approaches of Denzin (1989) and Hutchinson & Skodol Wilson (1992). Individual issues were marked off on the list of questions as they were covered by the subjects in order to ensure a complete set of data. Additional issues were also explored as they emerged.

3.9.5. *Preparation of the data*

An audio recording of each interview was made and transcribed using a professional service - the text document from each checked against the recording to identify any contamination of data and necessary corrections made. Each transcript file was uploaded into Nvivo and coding began.

3.9.6. *Analysis of the data*

Coding of the data, according to Strauss & Corbin's (1990) approach, required *open*, *axial* and *selective* coding - open coding being the initial stage of data analysis involving "identifying patterns and discovering theoretical properties in the data," (Bowen 2008, p144). Because of the inductive approach being taken to analysis, all nodes were created as a result of the emergence of individual themes within the text: the "nouns and verbs of a conceptual world," according to Borgatti (n.d.). Boyatzis (1998) defined a theme as "a pattern in the information that at minimum describes and organises the possible observations and at maximum interprets aspects of the phenomenon" (p161), and this was borne in mind as the coding progressed, (process illustrated in figure 20).

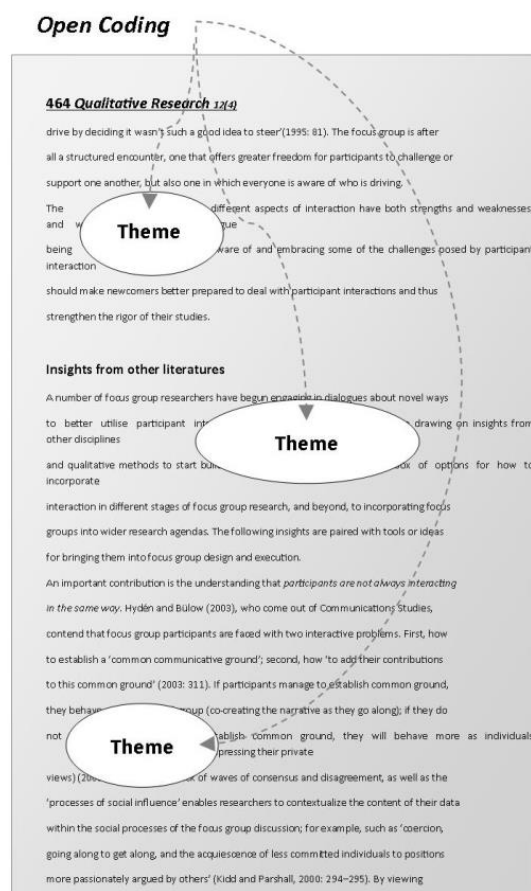


Figure 20: Emergence of initial themes from the data according to Strauss' method of open coding. Source: the author.

Meta-themes were developed from the emergent themes and these were structured as parent nodes within Nvivo - for example, 'Cognitive Issues,' and 'Definitions of Sketching.' As new transcripts were analysed, further themes emerged from them. As new themes were identified, so did the iterative process of revisiting already coded

transcripts to code for new themes, (constant comparison). And so the number of parent nodes increased. According to Braun & Clarke (2006) to avoid loss of context when coding, a little of the surrounding data should be kept: whole sentences and sometimes paragraphs pertinent to the theme were coded to avoid loss of context. Braun & Clarke (2006) also cited the importance of coding data as many times as necessary to ensure it was linked to all themes it related to, and again, this was observed during coding. The Axial coding enabled identification of the further issues within themes identified during open coding, to "understand categories in relationship to other categories and their subcategories," according to Walker & Myrick 2006, (p553) – (this is modelled in figure 21, below).

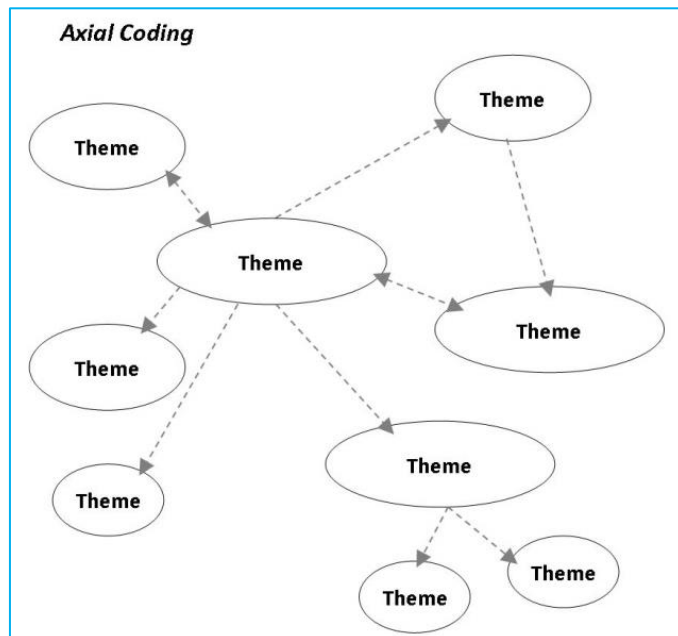


Figure 21: Axial coding used to identify categories and relationships within the data. Source: the author.

Selective coding, “the process of selecting the central or core category, systematically relating it to other categories, validating those relationships, and filling in categories that need further refinement and development,” according to Strauss & Corbin (1990, p116), began towards the end of the interviewing stage of the study. The individual nodes were considered regarding their relationship to each other and their relative importance to the issue of sketch inhibition. This process helped to develop the structure for the presentation of findings: the structure designed to create a narrative of the phenomenon, (see figure 22).

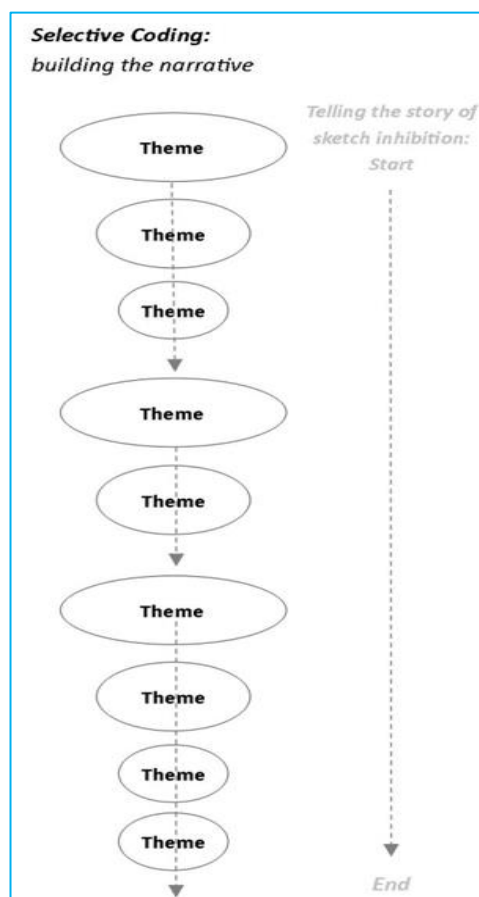


Figure 22: Development of themes into a narrative of sketch inhibition. Source: the author.

3.10. The learning style survey

3.10.1. *Basis of the approach*

During pilot interviews with design students the possibility of a link existing between sketch inhibition and learning style or preference was raised by one subject. This offered the opportunity to develop the methodology, (see figure 19), again, according to the Grounded Theory approach, in partial response to Objective 5:

“To explore the nature, common causal factors and effects of sketch inhibition among designers.”

During the very first pilot interview, sketch inhibited subject S1 (2016) stated, *“I’m dyslexic... I have quite bad attention problems, just terrible.”* Having undergone assessment for learning differences, he reported the findings of his assessor: *“although my working memory is bad my overall intelligence is okay... the working memory doesn’t want to work... I can really heavily notice shapes. She did the shape test with me... she said you’re incredibly good at shapes.”* The subject’s ability to recognise and work with visual information, but also be sketch inhibited suggested that learning difference and/or learning preference might afford benefit to the study, and so this was pursued.

3.10.2. *The methodology*

Initially, the literature was accessed to establish context and understanding of learning styles and to investigate potential primary research methods available to the study. Based upon findings relating to learning styles, (presented in chapter 7), it was decided that in addition to being interviewed, student subjects - both sketch fluent and sketch inhibited - would be required to complete two learning style questionnaires: the Felder Solomon Index of Learning Styles questionnaire and the VARK questionnaire, and (see Appendix 9). Student subjects were given both questionnaires and completed them either before or after interview according to their preference.

3.10.3. *Sample size*

Kelley et al. (2003) observed this should be based upon “*the resources available, the aim of the study, and the statistical quality needed for the survey,*” (p264). It was considered that the existing set of student interview subjects would provide enough data for an indicative study – clearly, an exhaustive future study could provide greater accuracy, but for this purpose, the sample was considered fit for purpose. Fifteen of the seventeen student interview subjects, (nine sketch inhibited, six sketch fluent), completed the questionnaires and the data analysed using a simple statistical method.

3.10.4. *Preparation and analysis of the data*

The interpreted data are presented in tabular form, (see Appendix 10) – and based upon the data, a judgment about learning style was made and summarised at the bottom of each set. These were translated into visual representations to allow for comparative analysis between the fluent and inhibited sets, and between individuals within sets.

The VARK findings were illustrated using radar diagrams, identified as the most appropriate method for visualisation of small sample results across multiple variables. The Felder Solomon LSI findings were illustrated using bar charts. Analysis of the data is presented in Chapter 7.

3.11. The longitudinal study

3.11.1. *Basis of the approach*

During the formal review presentation and as a result of the findings, the notion of sketch inhibition affecting the employability of sufferers was discussed. At this point, it was decided that a longitudinal study may be useful.

3.11.2. *Methodology*

Both inhibited and fluent subjects were of interest: the former providing data as to whether their inhibition affected their employability, the latter to act as a control for the study. During the interview process, students were asked if they wanted to take part in

the study. All subjects agreed to be contacted by email during May 2018 to establish the type of professional activity they were engaged in at the time.

3.11.3. *Sample size & saturation*

Fourteen subjects from the student interview set agreed to take part. Although a small set, and unlikely to provide the study with data saturation, it was still deemed worth pursuing as an indicative exercise.

3.11.4. *The question*

The question was simple and asked in an email sent to subjects in May 2018. This was, "*Are you currently working within the design industries?*"

3.11.5. *Preparation and analysis of the data*

Once replies had been received from subjects they were analysed and are presented in Chapter 7: The Learning Style Survey & Longitudinal Study.

3.12. Case Study - Leicester School of Media Drawing Centre

3.12.1. *Background to the method*

During the interviews with educators, Chris Wright was identified, having set up the Leicester Media School Drawing Centre - LMSDC - in January 2018. It became clear that his purpose, ethos and teaching approach would be of benefit to the research, above and beyond that of educator. The data he and his students provided developed into something of a case-study – an unintentional but valid result of applying Grounded Theory.

3.12.2. *The method*

An initial interview was conducted according to the methodology for all other interviews. In addition to this, Wright presented his lecture on drawing theory and demonstrated work that students had produced during sessions. Feedback from casually attending students was gathered. Contour Fashion students also provided

feedback: this group had been referred by their course leader and undertook several sessions of drawing practice and related theory to improve their skill set.

3.12.3. Preparation and analysis of the data

The interview was recorded and transcribed as per the other interviews. This was coded using the same processes: open, axial and selective coding. The observed data and feedback from students was recorded textually and coded using the same method. Findings and discussion are presented in Chapter 8: Case Study - Leicester School of Media Drawing Centre.

3.13. Testing framework tools: action research using teaching & learning practice

3.13.1. Background to the method

As findings from the literature and initial pilot interviews were analysed and coded, they enabled a tentative set of management tools to be developed. These were tested during a level 7, MA Fashion & Textiles module; *FSHN 5006 Design Communication* in the semester October – January 2016 and the same period in 2017. It was not possible to conduct this research among undergraduate students, but it was felt that this would still provide a worthy representation of response to the proposed pedagogic framework for sketch inhibition management. Each group comprised thirteen to eighteen students all having completed undergraduate study in a relevant subject and achieving, typically, a degree classification of 2:1 or higher. Each cohort was entirely female, (with the exception of one male in the 2016 session), and included both UK and international students. All students were in their twenties, with one exception in the 2016 group; a mature student (female) in her early forties. Although not presented to the study as a sketch inhibited set of subjects, it was considered useful to have an insight into perceptions of this: to gauge the levels of perceived sketch-inhibition, the 2016-17, thirteen-strong cohort were asked at the beginning of the semester whether they felt they could draw: only two said yes. A similar response was provided by the 2017-18 group.

3.13.2. *The process*

Each teaching session comprised a formal, taught element and a practical session. The formal element was a 50-60 minute lecture during each of the twelve weeks of the semester. Theory of sketching, based upon the research findings, was embedded into each lecture according to its benefit to other practical modules being studied at the time. This theory addressed design problem formulation, design development, mental imagery, lateral and linear design ideation, reinterpretation, observation, and a history of design sketching.

The practical sessions around *mark-making tools, materials and techniques* were conducted in a studio environment during each of the semesters utilising theory covered during the lecture. Students were asked to provide materials (e.g.; paints, ink, pencil, charcoal, chalk, pens, brushes, sponges and various substrate types), and given specific tasks;

Exercise 1: *Mark-making exercise*. Intention: to reduce inhibition and anxiety towards mark-making. Individually, students were asked to utilise all of the mark-making materials available to them. During an hour-long period, they were asked to create as many different marks as they could with each material or tool. These were critiqued as a group.

Exercise 2: *Observation*. Intention: to improve observation of external entities, improve mark-making skill in response to observation of such entities. A collection of pots, bottles and small, simple geometric objects were placed in a still life set-up. Students were required to observe and draw these using only pencil. Erasers were not permitted.

Exercise 3: *Recording mental imagery*. Intention: to encourage use of and fluency in mental imagery. Students were asked to close their eyes and visualise an environment based upon a verbal description given to them. Once this mental imagery was developed in as much detail as they could manage, they were asked to sketch it.

During this process, students were encouraged to close their eyes and revert to their mental imagery to recall detail. These were critiqued as a group.

Exercise 4: *Comparative interpretation exercise*. Intention: to reduce inhibition involving peer judgment. Students were given a flashcard showing a noun and given several minutes to describe the said noun through mark-making. These were critiqued as a group.

Exercise 5: *Reinterpretation*. Intention: to encourage the use of interpretation and reduce ownership of sketch output. Individually, students were given flashcards showing a noun, and given several minutes to sketch an image of it. Once completed, they were asked to pass their sketch to the person sitting next to them. Students were then required to develop the sketch in front of them. These were critiqued as a group.

3.13.3. *Preparation & analysis of the data*

Observations were recorded in note form after the practical sessions and analysed using a thematic approach. Additionally, module feedback surveys were completed by all students as part of the university's quality assurance process. This comprised a set of questions required to be answered in an online survey provided on the virtual learning environment, the data from which would inform future module content and activities. A copy of the results from 2016 and 2017 was acquired for analysis. This is resented in *Chapter 9: Fulfilment of the Objectives*.

3.14. **Presentation of findings**

The above methodology was duly applied and the following chapters present and discuss the findings of the research activities.

Chapter 4: Interviews with Educators

4.1. Introduction

This chapter, and additionally, chapters 5 and 6 consider the data gathered through the semi-structured interview method as described in the methodology. The position of this activity within the Grounded Theory approach is shown below:

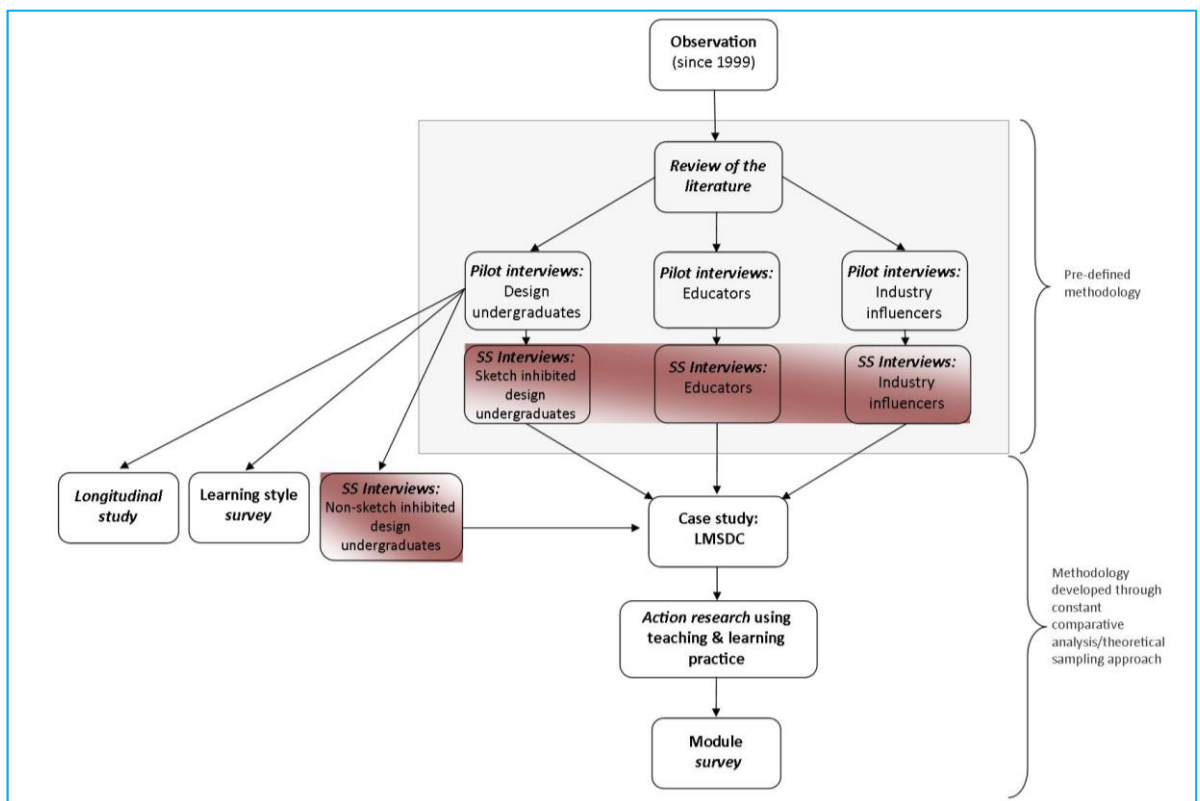


Figure 23: Position of the semi-structured interviews within the Grounded Theory approach. Source: the author.

4.2. The sample

Unlike the student group, issues of compliance did not affect this sample. However, access to individuals was more of a problem with data gathering conducted over a 21

month period. With the exception of one participant who preferred to remain anonymous, subjects were: *Dave Bramston* (Principal lecturer - Enterprise, University of Lincoln), *Dr. Joran Booth* (Lecturer - School of Mechanical Engineering, Perdue University, USA), *Simon Downs* (Programme director - BA Hons Graphic Communication & Illustration, Loughborough University), *Rosemarie Fitton* (Subject leader - Interior Design, De Montfort University), *Nicky Harding* (Senior lecturer - Interior Design, De Montfort University), *Stuart Lawson* (Subject leader - Product Design, De Montfort University), *Tatjana Leblanc* (Head of Department - School of Design, University of Montreal, Canada), *Dr. Clare Lerpiniere* (Senior lecturer - Textiles, De Montfort University), *Paul McNicoll* (Senior lecturer - Fashion Design, De Montfort University), *Michael Powell* (Associate Professor - School of Media & Communications, De Montfort University), *Gillian Proctor* (Programme leader - Contour Fashion, De Montfort University), *Dr. Pam Schenk* (Professor - School of Textiles, Heriot Watt University), *Neil Stacey* (Subject leader - Undergraduate Architecture, De Montfort University), *Martin Stacey*, (Senior lecturer – Technology, De Montfort University), *Chris Wright*, (Senior Lecturer - Leicester Media School Drawing Centre, De Montfort University), *Anonymous 1* – (Lecturer, De Montfort University).

All raw data is presented in transcribed form in Appendix 6 together with a ‘Coding by Node’ model for each subject, (described below).

4.3. Meta-analysis of the interview data

Thirty thematic nodes were created during analysis of the data. The node ‘Teaching and learning’ was by far the largest: a total of 313 codings were made and all subjects presented data on this issue. The next largest was the ‘Student behaviour,’ node eliciting 117 individual codings from 15 of the 16 subjects. ‘Digital tools’ elicited 79 codings, and ‘Pre-university education,’ 78. The least coded nodes were ‘Gender issues,’ ‘Peer issues ’and, ‘Definitions of drawing and sketching,’ each coded only once. Additionally, ‘Student financial issues,’ and ‘Epistemology’ were each addressed by only one interview subject.

Nvivo was used to create a 'Coding by Node' model for each subject's data: this summarises the nodes and number of codings into each node from every interview transcript – these are placed at the end of each transcript in appendices 6, 7 & 8.

4.4. The findings

Based upon the process of open and axial coding, findings from the data are presented in meta-themes and further divided into sub-themes. The sketch used to support axial coding is presented in figure 24, and illustrates emerging relationships and categories.

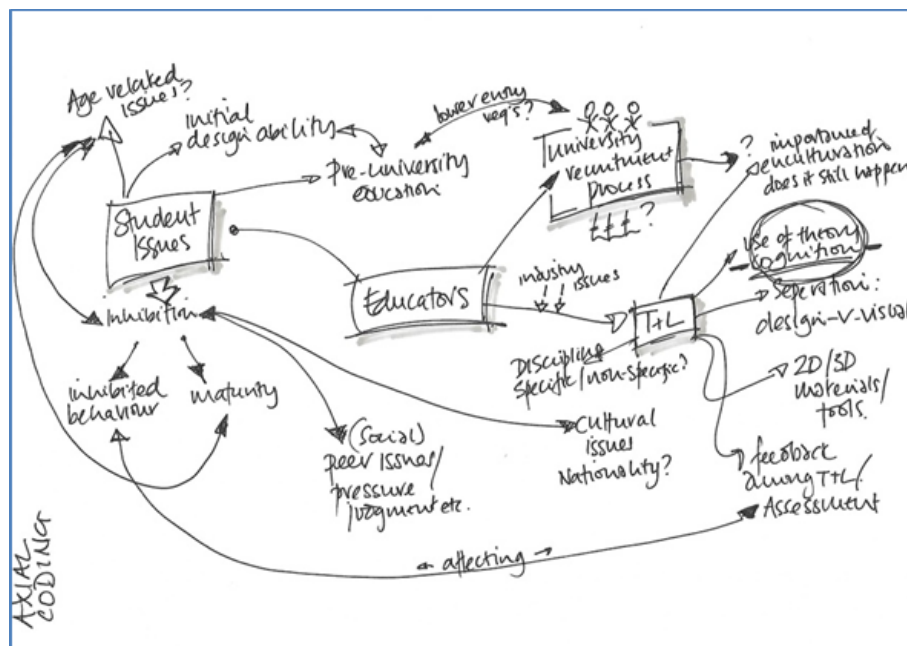


Figure 24: Axial coding of emergent themes from the data. Source: the author.

Although order of presentation does not imply a hierarchy or 'importance' of one theme over another, (as these are ultimately all of importance to the study), it does provide structure to a linear presentation intended to give a full picture of the themes identified in the data. It should be noted that in some instances two thematic nodes may have been blended into one heading as the data from each was convergent.

4.4.1. *Initial perceptions of sketching*

Sketches were described by subjects who identified multiple uses and benefits including being essential for communicating the design process. McNicoll (2016) identified their importance in the relationship between designer and non-designer, Schenk (2017) describing their use between designers of different disciplines. Fitton (2016) noted their inherent discipline non-specificity: *"it's the same process... plane, form and line, the basic principles behind everything...product, furniture, interiors."*

The function of the sketch as a visual language was considered by Downs (2017) describing the effective designer as one who, *"doesn't talk about drawing for drawing's sake, he talks about visual languages."* Proctor (2018) suggested that such visual language acted as a driver for exploration, *"using that visual language ...to explore what the potential of something is,"* and, *"the visual language processes... informs what happens next."* Additionally, tacit information, a vital component of design knowledge was considered by Booth (2017) to be more effectively communicated using the sketch than other methods.

The role of sketches as a driver of concept development was identified by McNicoll (2016). He had observed drawing enabled the designer to *"record ideas that can become resolved designs from that experimentation."* Bramston (2017) identified the same activity using sketches: *"it's starting with something very vague and refining it continually."* Sketches were also identified to function as decision-making tools, Powell (M. 2017) noting, *"you start to make judgements about 'that one is better than that one.'"* Downs (2017) referred to Tversky's (1999, 2002, 2003) research that identified sketches for *"allowing you access to your interior dialogues in a tangible form to see if they actually fit the purpose."*

Cognitive issues and the support of mental activity during the design process were identified: *"drawing is about thinking your way through things and planning"* (Schenk 2017). Schenk (2017) stated that sketching was, *"a fundamental human capacity for doing so many things... you append your visual memory through drawing... (sketches) serve a purpose, and seeing a drawing is...to facilitate certain kinds of mental activity."* The effect of

task complexity upon working memory capacity was acknowledged by Schenk (2017): *“There is a limitation on the amount of ideas and a limitation on the range of development of ideas - the capacity to try things out - it’s all affected by drawing.”* Downs (2017) concurred: *“since humans have very limited cognition, it’s probably better to cognitively divide down the task... then draw and develop the idea.”* Powell (M, 2017) suggested that the relationship between cognitive activity and the sketch was important to instil in students: *“understanding that physical skill and how the brain works, is training people to make really quite high level judgements relatively unconsciously.”* The sketch offered fast data management during a complex process: *“it’s a rapid transmission of ideas but it’s also a mode of thinking...early stages of idea generation would...be done in sketch form because it’s fast and portable,”* (Powell, M 2017). Bramston (2017) likened sketching to shorthand, *“it has to be something that’s instant.”*

The qualities needed to utilise sketching effectively were considered. Proctor (2018) cited the designer’s ability to see as important: *“drawing is 80% observation... It’s a process that leads onto something else.”* Expertise was also mentioned by respondents who identified a relationship between sketching ability and creative output: *“the more you do the better you are,”* (Harding 2017) and, *“good creative art students can’t help but think and express themselves visually,”* (Powell M, 2017).

4.4.2. Educator perceptions of industry

The importance of sketching to industry was confirmed by several subjects. Of the games and animation industries, Powell (M, 2017) stated: *“even though these are very technical businesses, they absolutely revere fundamental manual drawing and painting as valuable skills.”* Proctor (2018) described her observations of the degree shows: *“the industry makes a beeline for the sketchbooks, they don’t look at the garments, they look at the sketchbooks.”* Similarly, McNicoll (2016) said of the fashion industry, *“the constant ask... was, ‘(I) want a student be able to draw it, not CAD it... I want to be able to sit in a meeting... and I want them to be able to draw it on a piece of paper right then and there.’”*

Stacey's (N, 2017) contact within the architecture industry had told students, *"they really want to see your ability to sketch."* He described a mock interview process that undergraduates went through with recruiters: *"they hear... somebody saying 'you need to have evidence of your sketching ability in your portfolio,'... then they suddenly believe that we haven't been fibbing to them, (Stacey, N. 2017). Powell (M, 2017) described the games industries' need for suitably qualified recruits: "technical artists can command any salary that they want because they are like gold dust."*

The relationship between designer, client and the sketching process was raised by several subjects: *"designers need to be able to sketch things out quickly in front of clients," (Fitton, 2016) and, "when they get into the professional environment... ability to sit in front of a client or an employer and sketch out their ideas is really critical" (Stacey, N. 2017). Harding (2017) elaborated on this, clients becoming active in the design process and not merely passive investors: "things that were drawn by hand seems less set in stone so from a client perspective, they would go, 'okay this is just a sketch, that means I can have input, I can change things.'"*

Fitton (2016) endorsed sketching with clients as a means of gaining their trust: *"Their perception is you're brilliant, you can do this, and they're expecting you to draw... and they're amazed because they can't draw at all."* Interestingly, Schenk (2017) observed that designers *"did some drawings...would photograph and send the client just like that. Very different, uninhibited use of drawing the client than would have happened 30 years ago."*

Downs (2017) made an interesting point – that sketching was a means to remove professional self-doubt: *"design is the only field where it's actually part of your job to sit down and to actually work through to a state of good modelling where you are pretty damn sure that you have resolved all of the issues... the process of drawing and working through problems through drawing should help you to remove the fear."*

4.4.3. *The extent of sketch inhibition*

Of the subjects who gave an indication of the levels of inhibition on their respective courses, there was disparity. Lerpiniere (2017) and Leblanc (2017) both suggested that 80% suffered some kind of inhibition, Leblanc suggesting that in the first year, *“nobody finds himself sufficiently adequate.”* Lawson (2017) believed that *“25% are comfortable drawing to a point and 75% to varying degrees, for varying reasons struggle with it”* – he also suggested *“20% of people can never draw well...they also never get really good grades and they never really apply themselves.”*

Stacey (N, 2017) believed the extent of inhibition was *“50% - it is massive,”* but Downs (2017) suggested a lesser figure of 10-15%. Despite this variation in figures – these based purely upon observation of individual subjects from a variety of design disciplines - the fact remains that sketch inhibition is a clearly identified phenomenon within design higher education.

4.4.4. *Symptoms of inhibition in design output*

Harding, (2017) described the quality of design development work among inhibited students: *“the sketches that they have got they are either horrid or they are not well formed... the weaker students... only have these two or three sheets... and they are quite painful.”*

Similarly Fitton (2016) bemoaned lack of output: *“they present their sketchbooks and we can have students who have got as few as four pages of drawings... for a whole module’s worth of development sketching.”*

This appeared to have an effect on the development of concepts: *“what they don’t do is progressive ideas because they can’t draw things accurately,”* (Lawson, 2017). Schenk (2017) endorsed this: *“there is a limitation on the amount of ideas and a limitation on the range of development... it’s all affected by drawing issues.”* Harding (2017) described her frustration at this lack of design development: *“they think they can just do one sketch layout plan and that it’s resolved.”*

Booth (2017) observed his mark-making experiments with sketch inhibited designers at Purdue University, USA: *“Inhibited students can have very short stroke length, especially for*

a large curve.” Additionally, “if they’re filling a small portion of the page, that’s also an indication,” he added, “having really scratchy sketches, or having lots of tiny scratches are both indicators of feeling inhibited.” He also referred to the kinaesthetic aspects of sketching, “if the lines are wobbly, that’s an indication that they are taking a long time to make the line... because they’re so worried about the action of sketching, that they are not focusing on the feeling of sketching.”

Anon1, (2017) referred to the quality of finished designs among inhibited students, evidenced by, *“limited shape awareness... naivety in the lack of drawing and therefore in the intrinsic detail of the outcome.”* She described how such students attempted to compensate using other materials, with little success: *“they are toiling but they are kind of designing it at the same time... and it’s all a wing and a prayer to the end.”*

4.4.5. Behavioural symptoms

Commonly observed by educators was the belief that, *“if you’re good at drawing, you’re good at photorealistic pencil shading,”* (Lerpiniere 2017) – a skill bearing little relationship to ideation sketching. The misperception of the ideation sketch as an artefact, (and not a development tool), was confirmed by Lawson (2017). He believed that students *“are focusing on the wrong thing which is ‘I want to do a drawing and I am tired of doing a poor drawing’”* - a common symptom among sufferers. McNicoll (2016) referred to a perception of mystique surrounding the ability to sketch, and suggested this might create fear within inhibited students: *“people are terrified of the word ‘drawing’... there’s a lot of mythology around the ability; where that ability comes from... is it a learnable skill or is it a dark craft?”*

Student perceptions of their own ability were considered. Lerpiniere (2017) coined the most frequently heard comment: *“oh, I can’t draw.”* The skewed perception of self among inhibited students was curious. Fitton (2016) described the attitude of inhibited students: *“once (they) have this sketch aversion... they’re scared of sketching because they don’t think they’re good enough.”* Despite this, she maintained suffers, *“had some beautiful sketchbooks which, even though they were absolutely fabulous, the students still didn’t think*

they were very good." She referred to her use of simple sketching during teaching sessions to communicate conceptual information, to which students would comment, (to her frustration): *"I wish I could do that, I wish I could have produced something like that,"* in one case, *"this particular student had... produced a beautiful sketchbook, but even when she went into the third year, she thought it was rubbish."*

Confidence appeared as an issue, Proctor (2018) referring to her inhibited students, *"Nine times out of ten it's a lack of confidence,"* the transition between secondary and higher education being a problem: *"this thing of 'big fish little pond,' coming from school where 'I've always been the best at drawing and there are seventy odd people in the room who can draw just as well, if not better than I can,' and that's daunting."*

Harding (2017) reflected on how confidence issues translated into teaching situations: *"if you are not confident at drawing it is quite difficult in that tutor group situation to show that little scribble sketch, although sometimes within that there's a really great idea.* Lerpiniere (2017) suggested continued praise a means to address such a dip in confidence: *"they need a lot of reassurance in the first year especially...they might say, 'I'm not good at drawing,' and I've said, 'that's lovely, you're really good at drawing,' and they say, 'no one's ever said that to me before'."* Additionally, Booth (2017) referred to the issues of mature students returning to higher education: *"if they have not practiced it or they're not comfortable with it, I think they're even more resistant to it than the younger students."*

When describing students with inhibition, subjects referred to a lack of skill set. Bramston (2017) said, *"They will have an idea but because they can't communicate it they can't draw it."* Booth (2017) referred to those with little ability: *"they truly are very bad sketchers... I would say that their level of sketching... is mainly at a fifth grade level."*

Both the *perceived* and *actual* lack of skill among inhibited students appeared to be embodied in fear; an issue that several subjects discussed, frequently using words such as *scared* and *terrified* to describe their students' responses. Downs (2017) maintained that his inhibited students' reluctance *"is about fear."* Anon1, (2017) endorsed this: *"I*

think that it's a fear factor." Stacey (N, 2017) observed *"a relatively high number of students... scared to pick up a pencil or a pen... who are terrified to put... their sketches on the wall."*

Perfectionism was identified during the interviews as a guise for fear. Downs (2017) explained: *"when they say that they don't want to do something or the very middle class ones ... frame it on the basis of, 'I am a perfectionist, therefore I will not do this because I am a perfectionist' - it always comes down to fear."* Similarly, Schenk, (2017) described students' preference for only showing finished work as another form of inhibition.

One of the behavioural symptoms of inhibition included absence from teaching sessions. Schenk (2017) referred to, *"a certain amount of hiding"* – a problem endorsed by many of the other subjects. McNicoll (2016): *"sometimes they stop coming to their sessions,"* and Fitton (2016): *"they will go to the extent of not having produced any sketching and not coming into tutorials."* Stacey, (N, 2017) had also observed a link between inhibition and absence: *"our attendance has been really low - we don't know whether the two are connected... a lot of time students weren't turning up because of what we were asking them to do."* Similarly, Harding (2017) noted, *"with the sketching and manual techniques that they are supposed to be doing, we are getting as little as half attending."* Apathy was described by Leblanc (2017), bemoaning, *"the kind of students you have all the time, they... tend to disappear, show up last minute, do the minimum... this is a lack of interest, motivation and you can't do much about teaching that."* Harding (2017) also noted apathy: *"I showed the students a series of layout drawings... probably twelve to fourteen drawings just for one area of a gallery, and they were like, 'that's a lot of work.'"*

Anon1, (2017) considered how absence might have a compounding effect on affected students' performance: *"They won't come in... and of course it's always worse when you see them next time, because they are on even more on the back foot."* She referred to *"classic"* attitudes and behaviours around inhibited students, suggesting she had observed these on many occasions in the past, attitudes being: *"embedded, as they would be in previous education environments, where you haven't done your homework, therefore you don't turn up."*

She suggested the size of student cohort affected inhibited students who wanted individual attention after a teaching session, describing, *“a really difficult fallout because the numbers are so large to capture them.”*

Within the studio environment, inhibited students used a variety of avoidance tactics. Lerpiniere (2017) stated: *“They’ll do everything they can to avoid drawing... you always get the ‘I’ve got another sketchbook at home... I just didn’t bring it in.’”* She described their typical response to being asked to sketch: *“they absolutely freeze because they’re all scared, they don’t want to look embarrassed in front of the others... the majority of them will do anything but show you their sketchbook if they can get away with it.”* Resistance appeared to be an issue regarding the production of quantity: *“I have never got a student to come in with ten sheets, let alone thirty,”* (Stacey, N. 2017). Lawson (2017) concurred: *“we ask them to do six drawings within a certain phase - getting some of them to do that six is quite hard.”*

Stacey (N, 2017) referred to reluctance towards sketchbook activity across an extended period of time: *“there is a sizable proportion... who will not open their sketchbook to show you and I think that’s a term and a half into the year... that’s when we really notice it.”* He also referred to frustration at being unable to manage the problem, saying to students: *“across a week I would expect you to be coming back with 30 of these sheets to see me next week. And I have to say I’ve given up... I have never got a student to come in with ten sheets, let alone 30.”*

Lerpiniere (2017) described how inhibited students pleaded their inability: *“they think you were born yesterday or they just say, ‘oh, I can’t do this.’”* McNicoll (2016) described selectivity in engagement with sketching activities: *“if it’s a session with an activity, they just pretend they’re doing it, don’t do it, or do just a part of it.”* Similarly, Lerpiniere (2017) referred to lack of participation as indicative of further issues: *“the ones who would do that would be the ones who were not that engage with other things as well.”*

Verbal communication as a replacement for sketching was identified. Stacey (N, 2017) complained about the difficulty in understanding students’ concepts presented this

way. Powell, (M, 2017) questioned the presence of any design process at all in such scenarios: *"sometimes you'll get a student go, 'I've got a great idea for a thing,' and they'll give you some rambling story and it's like, 'well, you're not a novelist... show us some pictures,' (to which they reply) 'oh no, I haven't any.'"* Written information as a substitute for sketching was observed by Booth (2017): *"they just sit in front of the piece of paper with a pen and then they'll just start writing... they will minimise the amount that they have to sketch."*

Utilisation of alternative media in the search for a sketch replacement was noted by Lerpiniere (2017): *"They kind of get around that by doing abstracts or doing textures or working with photography."* Stacey, (N, 2017) was frustrated by student behaviour, deferring to digital media when asked specifically to work manually during a drawing annotation exercise: *"I say, 'I want you to write your notes by hand,' and at least ten, if not, fifteen per-cent will just ignore me."* In contrast, Stacey (N, 2017) referred to one fluent student, describing her unusually prolific engagement with sketching: *"(Student's name) is the only student who has done it - that's one out of 88 - and her submission is extensive. Because of it, her work is, in terms of quantity, twice as much as any other student, because she recognizes that sketches are valuable."*

Overworking sketches was cited as a symptom by, Lerpiniere (2017): *"they'll spend hours trying to correct."* Bramston (2017) noted the extensive use of erasers in the search for perfection and how this adversely affected progress: *"a lot of the students will rub... or cross out an idea and at the end... they've probably done twenty ideas but actually they have only got one on the sheet."*

The attitudes of inhibited students were alluded to by several subjects. Anonymous 1 (2017) described a tendency for them to be *"chippy,"* elaborating; *"they don't want to talk to you about it and don't want to do it...and will try and avoid contact."* Lawson (2017) suggested that inhibited students with poor attitudes tended to, *"never get really good grades and they never really apply themselves... there is a link between an ability to draw reasonably well, and the good ideas, and the good work ethics and all these things."* Harding

(2017) described how some students use superiority to mask their inhibition: *“they think they know better, they think they know how to do it already... that it’s almost beneath them because they know how to draw, so ‘why do we need to have lessons for drawing?’”* Similarly, she observed preciousness among one sufferer, their refusal to participate because, *“I find it very difficult just to draw in this time slot between 10 and 12 because you say I need to.”*

Improvement in sketch ability appeared to correlate with the determination of the individual to achieve this. Anonymous 1 (2017) referred to two examples within her cohort: *“I have had people that change over a summer. They were poor at the end of the first year and they get a bit between the teeth, and they say ‘I’ve drawn all summer...have a look at this.’ Is it the same person? I can’t believe it.”* Of one inhibited student: *“she used to do these little tiny drawings in the corner of her sketchbook, and I used to say, ‘if you worked like that on a larger scale you would be phenomenal.’ And in the third year it just went whoosh - the finest sketchbooks I have ever seen.”* Lawson (2017) similarly cited a student with sketch inhibition who applied himself, with good results: *“he is doing first rate work after two years, so he has overcome that.”*

4.4.6. *Social issues*

Maturity was raised by a few subjects as affecting students’ ability to engage in their HE experience - their attitude towards sketching and drawing being part of that. Powell, (M. 2017) believed the recruitment of younger students was to their detriment: *“people who come in straight from A-levels have lots of other issues that need sorting out, and gets in the way of their degree.”* Similarly, Lerpiniere (2017) observed a lack of life experience as an issue: *“I just think they’re so young at eighteen.”* One solution would be to *“raise the entry age - this is controversial.”* She added that, *“the students who’ve gone out to placements for a year, they come back and they are so much more driven, so much more directed.”* The immature student appeared to require more direction and pastoral support than others which affected their ability to engage. Proctor (2018) described a field-trip to Versailles with her first-year students. When asked to draw details of the

palace from observation, she described disinterest in their surroundings. *"You get the odd one saying, 'it's really boring here.'"* She asked of them, *"what excites you?"* to which they replied, *"what do you mean by that?"*

Constructive criticism was better handled by the more mature student, according to Lerpiniere, (2017). She cited one individual as an example, receiving some negative feedback about her final project: *"other students would have cried, they wouldn't have the resilience... but she had really high standards which obviously helped her."* Similarly, Powell, (M. 2017) endorsed the importance of maturity, citing one of his students as an example: *"he really worked hard, soaked up everything we threw at him, all the criticism, all the carping, all the negative shit that you throw at an artist. He took it all on board and now he's a senior artist."*

4.4.7. **Culture**

Cultural issues were raised by some of the subjects, some of these affecting the ability or inclination of the individual student to engage in sketching and drawing. Fitton (2016) identified such barriers and the ability of the sketch to overcome these; *"you can have a really productive session with a student who's got limited language skills, through the medium of drawing and sketching."* She elaborated: *"it's a global communication tool, so actually (with) sketching, drawing, their language skills don't need to be so strong."*

Despite this, Proctor (2018) noted that the approach of certain cultures towards sketching was vastly different: *"India, China - their culture is copying traditional formats."* Schenk (2017) acknowledged this, stating that Japanese and Chinese cultures were often described as *copying*, something regarded with negativity in the UK. However she added that such cultures prefer to describe this differently: *"we don't copy, we emulate"* - the practice being regarded as one of skill. She had also observed during her teaching experience overseas that Malaysian and Indian students tended to have stronger drawing skills than those from China.

This difference in approach to drawing appeared to cause problems during student recruitment according to Proctor (2018), *“we’ve had to work very hard with our international agents to get them to explain, to the point where they take a portfolio and say, ‘this is drawing’.”* She described the disparity of standard in drawing between the UK and overseas, stronger students from the latter still being advised: *“you need to work on your drawing, because this standard is not good enough for the level we expect.”*

4.4.8. *Gender*

This was little mentioned by subjects, however, within graphic communication and illustration Downs (2017) noted reluctance within some male students: *“I am using the deliberate, ‘immature’ boys don’t like drawing.”* He also saw a shift in the skill sets of female students coming to study: *“we have started seeing arrival of a generation of young woman who are very, very technically proficient.”*

4.4.9. *Peer issues*

These were again, little mentioned by subjects, but where they were, offered an interesting perspective. The interactions between inhibited and fluent students were noted by Leblanc (2017) *“when you have students that are very strong and ... are mixed up with those that are weak, they (the weak students) are inhibited... because they don’t want to expose their weaknesses.”* She also noted that inhibited students were generally less productive during studio sessions: *“there is a teacher walking around to sketch with them - they’re still very hesitant and sometimes do not produce enough or do not put the effort in that day.”*

Proctor (2018) noticed a common behaviour among inhibited types: the need for peer consensus and support: *“A lot of the time they look to see what the person next to them is doing... they are very much influenced by what they see around them.”* This need for accord was observed by Anonymous 1 (2017) who described group critiques: *“if we’re going round the table, they are going to say things about each other so they tend to be lacking in criticality... because they want to pat each other on the back because they know they’re next.”*

The prospect of having to present in group situations, *“for some students, is genuinely terrifying”* (Stacey N, 2017). During studio situations, inhibited students were more likely to avoid sharing their work with tutors, as Schenk (2017) described: *“the classic one of not wanting people to see your sketchbook or... preliminary drawings.”* Anonymous 1 (2017) said such students, *“don’t want to show the work because... they are not feeling brilliant about it.”*

4.4.10. *Pre-university education*

It became apparent that there may be a relationship between student ability and their experience within secondary education and further education – an issue about which subjects were very vocal. The biggest complaint focussed on a perceived lack of drawing ability among students, and how this subsequently affected performance during their courses.

Powell (M, 2017) set the scene for this: *“there are things that you should have at the point you arrive at university and our students increasingly don’t have those, and that’s where the sketching comes in.”* Downs (2017) elaborated, on this lack of skill-set: *“if they could do nothing else but draw to ideate well... everything would be so much easier and you will be able to teach at university level to a much higher level.”* Proctor (2018) observed a shift in priorities as a possible reason for this: *“I used to draw every day... kids don’t do that anymore.”*

Stacey (M, 2016) suggested that primary education was as a starting point for the development of sketch inhibition, with children as young as seven *“thinking that their very early scribbles or conceptual artwork isn’t good enough.”* Additionally, he referred to the largely female influence upon children in education at that age, describing, *“female teacher values being imposed on kids ... making everything neat and tidy and pretty.”*

Individual teaching style was identified as an important factor in shaping student attitudes, (and potentially their lifelong approach), to drawing and sketching.

Lerpiniere (2017) stated: *“it is about what happens at school... how they are encouraged.”*

Likewise, Proctor (2018) noted the effects of discouragement on young children:

“everyone can draw, all children draw, until they are about eight and someone says ‘you’re crap at drawing,’ and they stop.”

The regard for art in schools was considered by Powell, (M, 2017). He described a somewhat depressing hierarchy of subjects: *“if you are smart at school you will be forced into the STEM or academic subjects. If you’re a bit less smart you go into the humanities. As you go down the ‘what is important to the schools rankings,’ you start moving people down to where they are doing you no damage - and they underpin the arts.”* He also described how art subjects were subscribed to by three types of student: *“of the ones who really wanted it... there are the ones who are hopeless at everything else, and people... too lazy to do anything else.”* He also described talented art students being disadvantaged by the education system: *“stop short-changing the art students... they deserve to be as good as they can in the fields that they want to get into, so teach them some fundamental skills,”* (Powell, M. 2017).

The national curriculum was a source of frustration, Downs, (2017): *“I see really excellent teachers in... high schools who are horribly inhibited by a terrible curriculum.”* He believed, like Powell, the ability to engage in art-based subjects was being undermined in favour of more academic subjects due to: *“the demands of government on the curriculum.”* As a result of this, and according to Schenk (2017), *“writing and arithmetic are all favoured, but... drawing should be favoured as much; there is very little, on the curriculum now... it’s fundamental for everybody, and... education loses from (it) not being seen as a fundamental thing in class.”*

The issue of mandatory testing throughout secondary education was contentious. Booth, (2017), who suggested that *“the majority of students are very good at taking tests... but they are generally not much better at anything else.”* Because of this, he maintained, *“we’ve learned how to be not creative as we go through the education system.”*

Of the art syllabus in secondary schools, Downs (2017) was disparaging, suggesting the approach was inappropriate to building relevant skills: *“they are supposed to go and*

observe some artist... and derive some information from doing some stylistic mimicry, or... (gain) expert knowledge of... production systems and applications that would be too much to ask from PhD students." Bramston (2017) described the confusion between design and fine art within schools, the different approaches to the disciplines not recognised: *"you ask them to sketch an idea (and) they will do it (with) their art department head on, so they will spend a long time... putting down an idea... putting down too much information."*

The A-level syllabus garnered some strong opinion. Proctor (2018) was critical of the current system: *"Stop doing things like A-level textiles, it's a waste of bloody time... Teach them how to draw, encourage them to draw - all this farting about."* She described her attempts to get schools to, *"just get them to draw... we want them to come and have a really good basic skill."* Lerpiniere (2017) identified the same issue: *"It's good to have a textiles A-level but I would prefer, personally, to see... a drawing. We can teach them how to weave and... to knit... but really it's about the potential."* Lawson (2017) suggested the plethora of alternative design-based A-levels was a distraction from learning proper skills: *"if design technology didn't exist people would have done art."* Interestingly, Downs (2017) cited the public school system as providing a better foundation for students entering university, suggesting that those who had come through this had the benefit of being *"taught drawing in a more formal and traditional method"* – a skill he believed stood them in good stead for their HE experience.

Bramston (2017) suggested both GCSE and A-level design courses didn't imbue students with an accurate understanding of design. Students' output, he noticed, was mainly, *"a sheet full of writing... images... one drawing in the corner represent(ing) a thing that they are going to make... but that one drawing hasn't come about from a process of 100 sketches."*

Lawson, (2017) observed the type of drawing that students were taught within A-level art was mainly *"drawing from their imagination... which is good to a point but...what they lack is observation... it used to be part of education to do life drawings, but not anymore, so*

their drawings are of the wrong sort... we don't beat them up for that - that's the education system."

An artefact-centric approach to drawing appeared to exist within secondary education. Whether originating with the syllabus or through imposition of individuals, it clearly had an effect upon output and caused issues for design students within higher education. Downs (2017) was sure that *"high school courses confuse rendering with drawing at every level... most of them think that they are trying to get a life-like rendering."* Downs (2017) suggested that this approach was of little value to students at his institution: *"it doesn't work for my colleagues in fine art... textiles and... visual communication."* This reverence towards the sketch as an artefact, (as opposed to a visual thinking process), was identified by several subjects. Bramston (2017) described its effect among A-level students: *"there is a lot of respect for the paper - there is too much respect, you know, the best handwriting has gone onto there and it's all in columns."*

Stacey (M, 2016) observed the typical teacher's attitude within primary education: *"it wasn't obvious to her that pushing kids... into producing neat and tidy, perfect artwork... at the investment of a lot of effort was either educationally valuable or imposing values that ought to be imposed."* Fitton (2016) added: *"they spend so long at school working through a process to get to the final element ... 'do this, do this, you've attained perfection,' and the whole emphasis and the grades are based on the end product... there is not enough weighting given to the process."*

In respect of secondary art and design education, Downs (2017) made this final damning statement about the syllabus: *"I have been a paid consultant by one of the exam boards on this, and I was quite rude about a lot of the assumptions that they had when it got to A-level... If you want to quote me, you can say that the whole of the pre-Foundation or the pre-BTEC sector for Art and Design drawing should be burned to the ground."*

The routes into design HE, specifically art foundation and BTEC art and design courses were discussed. Art foundation courses were preferred by subjects, Powell (M, 2017):

“our preferred route tends to be good traditional A-level art and traditional foundation course. Those students tend to be better enculturated, more grounded in the fundamentals and therefore more able to take on the extra stuff.” Lerpiniere (2017) noted the benefit of this route *“the ones who do foundations obviously have a much better grounding because...they do life drawing... and it builds up their confidence, but... sometimes they’re ready to do a degree after A-levels.”* Downs (2017) too identified that *“foundation courses are excellent and do a good job,”* but additionally, *“most students will still come from a previous A-level position or BTEC.”*

Powell (M, 2017) raised concern about the recruitment of demotivated and weak students onto degree courses because of the removal of the mandatory requirement for art foundation. In the past, typically, *“You definitely didn’t get onto a degree course if you had no foundation... now all of those barriers are away.”* He contended that BTEC courses were an issue. Asked about the BTEC equivalence to A-level plus foundation, he responded, *“don’t use the word equivalent, we all know they’re not! They’ve been made to stay on in some form of education post sixteen and that’s now the gateway into a degree course.”* He added, *“BTEC students are the worst... they’re not the most academic students in the world - they’ve been driven down that route because they’ve got no other options.”* On being asked about the content of BTEC courses, he continued, *“they’re bad because of the way they’re setup and the reason they’re set up, and the fact that the curriculum generally doesn’t contain anything of any value to any subsequent degree course; no drawing, no proper 3-D modelling skills... you can be very poor at school, very disengaged, end up doing a BTEC arty route, and... they have introduced some new BTECs to try and persuade young people to engage and called them things like ‘game development.’”*

4.4.11. Student recruitment

The recruitment processes of institutions were interesting and courses varied in their requirement of drawing ability. Within De Montfort University, the requirements between courses within the same faculty varied widely. Harding (2017), like many of the other subjects, said, *“we expect to see some sketching before they even come on the*

course." Proctor's (2018), course appeared more heavily focussed on the use of drawing and sketching, *"if you can't draw or you won't draw, we're not going to take you."* Powell (M, 2017) referred to the demonstration of potential, being able to draw, *"not brilliantly, not Michelangelo, but enough to get ideas across."*

The limited amount of sketch material brought to interview by applicants was a concern. Powell (M, 2017) said, *"We are always deeply suspicious of portfolios that only have digital art in."* Proctor (2018) suggested a degree of denial among candidates about their ability: *"When people come to interview and I say, 'rate your drawing skills one to 10,' and they say, 'oh, well, maybe six.' I say... 'it can't be a six - you've only got one drawing with you.'"*

The importance of the sketchbook was clear. Fitton (2016) stated: *"We do place a...lot of emphasis on their sketchbooks when they come for interviews."* She described the sketchbook as, *"evidence of practice and engagement, and so we have taken students on before who have just brought a sketchbook - they haven't produced finished pieces."* Proctor (2018) endorsed this, *"I would rather see sketchbooks...than portfolios... your mind processes, your development process."* She also touched upon the element of fraud among applicants, *"anyone can put a portfolio together, and someone can do it for you - no one can fake a sketchbook."* Powell (M, 2017) described the use of a still life drawing test during the interview process in order to observe candidates' approach to drawing – *"we don't call it a drawing test... because the word test frightens people."* He also said he was, *"selective on the basis of... physical evidence of their engagement in, and their skills at art,"* something he believed was currently *"deeply unpopular and hugely unfashionable."*

The issue of students as a source of revenue for institutions and the effect of this on standards was touched upon by Powell, (M, 2017): *"a university looks at one set of data and we are looking at the lived experience, and there is a bit of friction."* His course attracted 500-600 applicants annually, many of whom dropped out before submission of a portfolio. He said his institution wanted to know, *"why are you throwing away all these opportunities to make money?"* In contrast Downs (2017) described a different approach

to recruitment at his institution: *“currently we take about one person in nine from an interview... we have a right to say no to students.”*

4.4.12. *Approaches to teaching*

Acknowledgement of the different approaches to sketching for design and fine art was evident. Schenk (2017), although fine art trained, bemoaned the elitism of that establishment and its effect upon designers; *“I do think designers should work from observation, but not life drawing... the problem with drawing is the association with fine art specifically, and talent.”* She added that design students generally, *“saw drawing as life drawing and it put them off.”* Powell, (2017), described its importance to games art and animation, but also the way it was being eroded: *“life drawing is clearly key for character artists, which is a surprisingly hard sell... conventional, traditional art students get why we do it, everyone else doesn’t... the more technologically focused and less art focused the courses are, the less that culture is in place,”* adding, *“it will bite us in the arse one day.”*

A lack of formality around the teaching of sketching was apparent. Schenk (2017) commented: *“I don’t know how many courses actually teach drawing... it’s still on a need-to-know basis.”* When asked how his students acquired sketching skills, Booth (2017) replied, *“I wouldn’t say sketching in the sense that you and I research is formally taught.”* Lerpiniere (2017) said her students must have *“drawing as a visual research tool - they have to draw all the way through,”* individuals expected to develop their own approach. McNicoll (2016) believed skills were often learned on an ad hoc basis: *“I think that kind of happens within other activities... things may be picked up... rather than (being) necessarily a targeted learning activity.”* Booth (2017) described the self-directed aspect of learning and consolidation: *“we rely on them enjoying it and choosing to continue practising on their own.”* Harding (2017) stated that sketching skill was developed through project-based learning, *“throughout the three years it is being maintained through the natural need and the lessons that form that activity, as well as the design work.”* However, despite this, she did add that students *“need to draw more to practice.”*

Syllabus structure was of interest: Schenk (2017) was the only subject to refer specifically modular schemes, endorsing them as having *“more definite content... because you have to justify one module being different from another.”* Lawson (2017) stated, *“drawing, sketching, rendering, it’s only the first term of the first year,”* adding that *“they should be spending 3 or 4 hours (per week) drawing.”* He added that after this initial teaching phase, students didn’t receive further formal tuition. Lerpiniere (2017) described a similar structure: *“at the start of year one they do a five week block of drawing, almost like a mini foundation to get them up to speed,”* additionally, *“a series of very directed workshops and very directed days of drawing,”* informal tuition continuing into the second year. A lack of time on the curriculum to teach required skills was cited as problematic, Lerpiniere (2017) stating: *“we don’t have time to teach them that type of drawing, observational drawing, they just have to go out and do it.”*

Of specific skills, Harding (2016) described her first year programme: *“technical drawing in first term... perspective drawing ... there (are) the drawing modules, the manual techniques... perspective drawing and learning to add tone.”* Lawson (2017) described *“a command of perspective and the ability to render detail,”* among the skills taught on his course. Leblanc (2017) described her first year teaching, *“acquiring a visual language... and abilities to visually communicate... rudimentary classic sketching and drawing.”* She also stated that at this point, students were introduced *“slowly but surely also to look at the digital tools.”* Lawson (2017) and Harding (2017) also described the addition of digital tools during the first year. Fitton (2016) detailed the content of teaching: *“CAD skills, 2-D and 3-D, and editing-type software such as Photoshop, In-design.”* The data regarding the use of digital tools and its effect on sketch inhibition is presented fully in a later section.

Downs (2017) described an assertive approach to teaching – the concept of the ‘scary tutor.’ He maintained that *“generating the persona of a slightly cranky uncle who is going to actually keep poking you if you don’t do it - it works.”* Within his course, *“everyone has to do everything - it’s like basic training in the forces, no one gets to get away with anything because otherwise it hampers them as practitioners.”* A similar approach was considered beneficial

by Fitton, (2016). Considering a self-directed approach she conceded that, *“we’re all a bit timid about pushing students to do things that they don’t want to do... sometimes people have to do things they don’t want to do because it’s good for them.”* Leblanc (2017) was also firm in her approach: *“before I allow them to go anywhere else but sketching, they have to get to a point where they put their ideas on paper one way or another.”*

The maintenance of sketching and drawing skills throughout degree courses was little referred to by subjects. However, Fitton (2016) described *“workshops within the visual communication modules... this goes all the way through three years.”* Stacey (N, 2017) described a less formal approach: *“as they move through the years and... into post-graduate we expect their sketching and drawing skills to continue to improve.”* Despite the variety of tuition, Lawson (2017) lamented that students, *“constantly remind you of their lacking, so it’s difficult to encourage, but they get very well taught.”*

Powell (M. 2017) revealed an interesting insight into his teaching staff: *“the visual part of my course is run by people who graduated from fine art courses in the ‘90s: nobody taught them how to draw, so they are now trying to teach people to draw on the basis of no technical or theoretical framework.”* He suggested an ideal scenario specifically for designers: *“I would...employ a lot of very old-school, old-fashioned government art-school-taught lecturers who will go, ‘okay, I’m going to teach you how to draw - it’s very simple... here’s a sphere, here’s a cone... those are your basic forms,’ a systematic approach to teaching drawing specifically for industry, mak(ing) it very clear that drawing in a fine art context is a different activity.”*

4.4.13. Specific teaching tools

Group-based activity was described by Lerpiniere (2017) who concluded that, *“it’s better to give them a task to do and everyone does it the same...just to force them.”* Shared sketches were also identified as reducing inhibition during the ideation process: *“they do a bit and then they pass it to someone else and they add to it... so at the moment somebody else has added to your drawing... you have lost control of it,”* (Bramston, 2017).

Tutor engagement within structured activity to encourage compliance was cited by Leblanc (2017): *"when I do the studio class I... accompany them through the process."* Similarly, Schenk (2017) often sketched during taught sessions with students, citing this as a tool for encouraging engagement.

Proctor observed returning students often being inhibited and benefiting from warm-up activities to reduce anxiety, *"often I will say to students, 'if you haven't drawn for a long time... give yourself three seconds, cover the page, get your hands dirty and just put colour down... and work the drawing towards you."* Booth, (2017) also reiterated the benefits of his sketching warm-up exercises for reducing inhibition in such scenarios.

Downs (2017) enjoyed scientifically proving to reluctant students that sketching was of benefit. He had used Barbara Tversky's (1997, 1999, 2002) work as a research-led cover for activities: *"it gives an assurance that there is nothing to be afraid of, doing something which doesn't involve beautiful rendering, it gives a rationale for what you are going to get from this."* Among reluctant students, *"it undermines their arguments about why they are not going to actually do it."*

The benefit of exposure to sketch material was cited. Proctor (2018) often used these in teaching sessions, and Fitton (2016) adopted a similar approach: *"we have a bank of materials from previous years that we show the students to try to encourage them."*

Anonymous 1 (2017) referred to using third year sketchbooks with younger students, describing how this had a daunting yet positive effect on their comprehension: *"we show them level six sketchbooks... so it's always very unnerving for them."* Schenk (2017) also described how showing her own drawings had a beneficial effect on her students.

Encouraging constant analysis was cited as important - Proctor (2018): *"we encourage them to write as much as they draw... (to) make connective links"* the use of notes an encouraged method of dialogue with the self. Verbal analysis of the process was described, Schenk (2017) citing how her students *"learn designing... through a process of joint discussion and critique."* Bramston (2017) described a similar process: *"a trigger to a*

conversation and something that can lead to possibly a different direction to the one that was initially intended.” Schenk (2017) endorsed the joint critique for analysis of sketch activity: “public forum... being able to read... drawings as well as being able to communicate... we used to put a lot of effort into joint crits... it’s clearly a situation that they face all the time in industry.”

Sketch reinterpretation to reduce inhibition was identified by Schenk (2017) who described the process: *“pick something you’ve done and blow that up, or take something someone else has done... work from somebody else’s drawing... put everything on the wall... find something and work from that and reinterpret it.”*

4.4.14. Design v visualisation

It became apparent that the teaching of designing and the teaching of visualisation were often intertwined, the terms *design* and *visualisation* used interchangeably by subjects. This raised the question as to whether they were all fully conversant with the significance of each activity and whether this was apparent to students.

Powell, (M, 2017) was asked about whether design and visualisation were taught separately: *“no, it’s one of the reasons for driving the modules apart... we need to make it explicit.”* Fitton (2016) described the separation of design and visualisation skills: *“we have separate modules... design process... (and) visual communication module which is where we talk about the quality of drawing, the quality of a line, using all the different mediums, using different methodologies.”* Harding (2017) did cite an issue concerning the close relationship between design and visualisation during project feedback: *“we always find it hard to separate what we are seeing in the visual to, ‘actually, has it got some design in it?’- and then you’ll find that you have to go back to the development work to try and then pick that thought process to... see where the design ideas come from.”*

4.4.15. Teaching & learning environments

Subjects often described the environments in which they taught, and although the possibility of these having a relationship with sketch inhibition was not initially considered, it became clear during the review of data that there may be a link.

Schenk (2017) cited the importance of the studio environment for student engagement; *“things that make students work in a studio is important.”* Lerpiniere (2017) referred to her students working both within the studio and in the outside environment. Powell, (M, 2017) noted the importance of working outdoors for improving observation skills: *“sitting in the landscape, absorbing that kind of atmosphere and being able to rapidly sketch.”*

Stacey (N. 2017) described the desk as a gentler approach to working: *“the fact that it’s on a desk and they don’t feel physically exposed, they are more comfortable talking about their sketching.”* Anonymous 1 (2017) believed this offered additional benefits, adding *“in the tables group they end up being... group tutorials because other students listen to your advice and write it down.”* Additionally, Anonymous 1 (2017) cited the panel session as helpful in encouraging engagement: *“a panel of tutors... sit around and... listen to each other - of course it’s a huge driver of how much work have you done.”*

Walls featured in subjects’ discourse. Stacey (N, 2017) told his students, *“I would just like you to pin it up... three sheets, you might pin up twenty sheets... I just want it on the wall so that we can all walk around and look at it.”* This created a beneficial environment for presenting sketch material to a number of students at one time and helped to drive critique. Schenk (2017) used walls for the same purpose during her *Make Your Mark* sessions for reducing preciousness and self-consciousness: *“we do lots of exercises and have the walls literally covered, and then... we just walked to the other end of the studio, turned round and said, ‘just look how very beautiful your drawings actually are,’ and the last thing we were trying to do was make a beautiful drawing.”* This approach, she believed, *“made them see that they were capable of a lot more than they thought.”*

The vicinity of students to each other appeared to affect output. Anonymous 1 (2017) spoke of students observing their peers, *“other people on other courses working next door*

to... a table of four, that kind of thing... you start to see what people are doing - amazing really." This type of peer learning was an implicit but useful teaching method: *"the third year... laid the work out...I said, 'even if you take one good thing from somebody else's sketchbook, that's a positive because you won't do the same thing in the same way, you will have your own interpretation of it.'"*

Schenk (2017) raised the otherwise unaddressed issue of the studio: *"what is the studio now? - because with a student, it could literally be the laptop, the library... it could all be on the laptop."* She suggested that this virtual studio environment may be having undesired effects on students: *"that in itself is inhibiting... you're not getting used to a public discourse. It's one thing about the drawing classes; you did at least see what other people doing - now you don't if you're only working in digital environments."*

4.4.16. Gamification of the learning process

This theme was developed later as it became apparent that gamification was evident as part of teaching and learning activity. Both Schenk (2017) and Proctor (2018) used such techniques to engage students, both inhibited and fluent with notable success.

Schenk (2017) discussed an interpretation exercise intended to encourage creativity. Giving students a number of words to use as the basis for reproducing the same image several times over, she told them: *"the first one was 'trace' and it went right through to 'memorise' and became increasingly less to do with producing a facsimile and more about seeking inspiration."* Proctor (2018) described an activity to encourage awareness of how concepts translated into materials and processes: *"I might put them into groups, blindfold one person...I say, 'you have to describe... the sense of what you're holding, so is it warm, is it dry... is it sharp, is it smooth?'... we get the rest of the group... to write the descriptive words."* From these descriptive words, students were encouraged to consider how they would be produced using appropriate materials.

4.4.17. Quantity

"It really is about quantity," – this was the shared opinion of several subjects: *"enforcing a quantity is very painful for the students, but that will get you the results you want,"* (Booth 2017). There was little consensus about the number of sketches that constituted an ideal, but all subjects had a rationale for their approach. Booth (2017) observed an optimum point for output: *"after about concept eight or nine... (you get) some really interesting concepts. You... go through a few just to get warmed up, and then you have a limited window."* However, *"beyond fifteen in any session"* would be of little additional beneficial to the student, adding, *"you really shouldn't brainstorm for more than twenty or thirty minutes at a time... you do get burned out...then you can't really recover that, that day."* Schenk (2017) described her approach: *"absolutely quantity... I want 30 and you've got an hour - or in my case half an hour."*

Proctor (2018) described the brick wall met by inhibited students, stating, *"if you reach a point where you think, 'what am I doing, this isn't working,' the answer is to go and draw it more."* Leblanc (2017) described the importance of quantity: *"I tell them to make 200 iterations."* She described typical behaviour of students: *"the first pages, everybody... repeats what they've seen in class... it's only after the sixth, seventh sketch page... they start finally to adopt a methodology... when you really don't know any more, nothing is in your head ... then you actually start sketching in the sense of exploring."*

4.4.18. Speed of working

Harding (2017) described timed activity to encourage output: *"with the timer in the room, saying 'alright we want you to do five sketches in fifteen-minutes... we are making them work very quickly, again emulating industry,"* and appeared to reduce self-consciousness. Downs (2017) too, related speed of working to reduction in preciousness: *"you can actually put down a sheet of ideas... scrappy and pointless little piece(s) of drawing that took you five minutes to do... it looks strong even at that level."* Booth (2017) referred to an optimum number of sketches: *"the speed is really important... the rate at which students usually create concepts is about one per five minutes."*

4.4.19. Materials

Several subjects described materials having an effect upon sketch inhibition. Although not considered to any extent by the literature, it emerged as a significant theme. When asked about traditional sketching materials, McNicoll (2016) replied, *"I think a lot of them are alien in a very contemporary developmental culture."* According to Bramston (2017), *"one of the scariest things for students... (is) the white piece of paper."* Fitton (2016) noted her reluctant students using limited media: *"they tend to stick to one thing - a pencil."*

Booth (2017) believed permanent forms of mark-making reduced inhibition by encouraging commitment: *"we make them sketch with pencils that have no eraser... or we make them sketch in pen."* Schenk (2017) believed that high quality substrates, including traditional sketchbook cartridge paper, increased preciousness. Downs (2017) favoured paper, generally, for being cheap and easy to share. Leblanc (2017) concurred: *"the less precious the paper or the tool looks, the more open and loose(ly) you're attacking the sketch."* Schenk (2017) described her use of *"newsprint, big children's jars of white paint, children's jars of black paint - as many cheap drawing implements as I could find,"* to encourage fluency. Transparent papers were mentioned frequently for offering additional benefits that opaque papers could not. Leblanc (2017) maintained that, *"when you're on tracing paper it's not as imposing, is not as frustrating... tracing paper doesn't have that effect on the definiteness."*

Scale emerged as a factor in sketch inhibition. Anonymous 1 (2017) described encouraging students to work on larger sizes. Bramston (2017) also observed that *"working on a bigger scale not only makes it easier to communicate to people but it opens it up so that everybody can see."*

Composed imagery was used frequently by subjects as a tool for improving output. Bramston (2017) noted that *"drawing is not actually limited to just a pencil or a pen and there are many instances where people refer to sketching but aren't actually using pen or pencil."* Downs (2017) described encouraging students to use a *"combination of drawn imagery and composed imagery... if we've got someone who is drawing inhibited."* He

maintained this was an ideal approach because: *"we are not looking for a beautifully rendered finished product."* Proctor (2018) described specific media used in this approach: *"it might be collage, it might be working with line, it might be layering things up."* Lerpiniere (2017) described this as one method of reducing fear of starting something new: *"just do some collage on those pages, so you're actually drawing over the surface of something just to get... away from that white page."* Fitton (2016) in addition, referred to the success of combining analogue and digitally composed imagery.

4.4.20. The sketch as a 3-D model

Although not initially considered to be a form of sketch, the three-dimensional model was cited by subjects for its capacity to drive concept development and enable communication, i.e., functioning in the same way as the sketch.

Bramston (2017) described blurring between the 2- and 3-dimensional during the creation of sketch imagery: *"I am trying to get students to generate ideas... to pick up that pencil and that piece of paper... but I am also trying to get them to sketch with the found object."* Leblanc (2017) also talked of *"exploring ideas, sketching, (with) whatever tool you are using - even a model."*

Fitton (2016) promoted sketch models to visualise mental imagery - some students unable to capture this immediately in sketch form: *"I can visualise something much easier in three dimensions - and I see that so much in our students."* She described coaching inhibited students: *"make a sketch model... now you can draw that model... and then you can alter that model by drawing... try to do it hand-in-hand."* She described the benefits of this with one inhibited student: *"she didn't know how to draw it, and I said, 'get some card, just do it,' and she started sketching from that... there were pages and pages and pages of beautiful sketches."* Of model-making materials, she described an eclectic approach: *"cardboard boxes, cereal boxes, egg boxes - shove stuff in, photograph it."*

4.4.21. Pastoral support

This was unmentioned by the literature, and was not initially recognised as an issue during the interviews. However, during coding it became apparent that there was a clear theme emerging – that of the relationship between student and tutor, and this was developed.

Continuity of contact appeared important for Anonymous 1 (2017) who noted that it gave her an advantage in managing weaker students: *“we have week-on-week tutorials... I have to see them every week to make sure that flow is there.”* Praise was also cited as important for building the confidence of inhibited students. *“You have to be really encouraging because if you say to a student, ‘oh that’s awful, what are you thinking?’ of course they are just going to switch off,”* (Lerpiniere 2017). Fitton (2016) also endorsed the importance of approval: *“giving them a lot of feedback and... praise... when they have produced sketches.”*

4.4.22. *Enculturation*

This was an interesting but little mentioned theme that emerged. Although minimal in terms of data, it was worthy of consideration as it appeared to relate to the individual’s need to belong, and had potential ramifications for sketch inhibition. Proctor (2018) described how enculturation had been an accidental benefit of her courses: *“I taught some of my staff team, and heard one of them a couple of weeks ago saying, ‘when I was a student, I remember Gillian instilling the importance of drawing in the sketchbook format and this is the basis on which this course runs.’ - It’s quite nice that this has perpetuated.”*

Powell (M, 2017) referred to his research, and made an interesting point: *“much of what we do is about enculturation, so we’re going, ‘Look, if you want to join our club, this is what you have to do,’ and that’s half the fun, right?... you get to join our club if you are good at art... drawing and sketching are part of (this).”* He explained, *“up until the ‘70s, the art curriculum in the UK was mandated by the government, there were the government schools of art and their purpose was to produce good craftspeople.”* He believed that since their demise, or incorporation into new universities during the early ‘90s, the culture that once pervaded art education no longer existed. He felt this was an important part of the

student's experience – and its absence was to the detriment of contemporary art and design education. He described his own experience of art school: *"I had to do a test to get into foundation and I think... (on) a moral level, people who want to become artists in this course, in this industry should be made to go through a certain process as part of joining the club,"* (Powell, M.2017). He believed this lack of enculturation meant that necessary skills had not been embedded through earlier education - students suffering as a result. Downs (2017) referred to a similar school of thought: *"it helps that we are all speaking from the same point of view so we have an established culture."*

4.4.23. Digital tools

It became clear that students rely heavily on digital tools during all stages of the design process. Of such methods, Stacey (N, 2017) noted that, *"the strongest students are able to do that and still have a sort of sketching mentality... their fluidity with digital drawing is good ... their creativity is not impaired by the use of digital"* - suggesting that this may not be the case with weaker and inhibited students. Schenk (2017) believed that attitudes to digital methods were in flux: *"I think it hasn't exactly come full circle but I think it's not seen by that many people as the be-all and end-all... it is just a tool and I think it's... you do think differently and act differently in a digital environment."*

One of the computer's shortfalls: its inability to replace the cognitive processes of designing was something that students were often unable to grasp. Powell (M, 2017) described a common observation: *"they think that's going to save their arse because the machine will do it."* Lerpiniere (2017) echoed students' belief that *"the computer is going to solve their problems for them... and if you can't draw with a pencil how are you going to draw with a mouse or tablet?"* This belief was also cited by Harding (2016), students thinking, *"I can resolve that through CAD so why do I need to do it by hand?"* Stacey (N. 2017) noted restricted creativity caused by such tools: *"Sketch-Up is the go-to tool for most students which we try and get them away from because it limits the way you think about things."*

Several subjects made the point that the ideation stage of design required manual sketching prior to digital input: *"It's really important that you can draw and certainly by hand before you even embark on any CAD work"* (Harding 2017). *"They would tend to start with their own drawings first before they went on to the computer,"* (Lerpiniere 2017).

The digital aesthetic was cited by several subjects as a potential problem; students being lured into a false sense of accomplishment by attractive imagery: *"there is this sort of illusion that if you create... glossy visuals then the design can resolve"* (Harding, 2017). Schenk (2017) described a common disparity between aesthetic and content: *"a digital drawing looks finished even though it might not be a completely usable design... it's a complete falsehood, but a finished, digital drawing represents the finished thing... that's a bit of a problem with digital drawing."*

Harding (2017) referred to the specific problems caused digital tools during assessment: *"you can be quite seduced by a glossy visual that appeared to resolve an issue,"* but bemoaned the *"lack of back-up and support work that really shows they've investigated it and come up with a good solution."* She described how students who were *"very middle of the road, haven't the ability or the confidence to... resolve a design,"* tended to defer to digital methods: *"you can create a Sketch-Up model and what looks like an interesting view (that) has got sod-all in it and actually no design."*

There was one reference - the only reference - to digital tools making a positive impact upon output. Leblanc (2017) described a struggling student whose sketching was too poor to decipher: *"they have no sensitivity"* she maintained, but his skill with design software was such that he could rectify this: *"in the 3-D, it was the most sensitive and most sensible 3-D representation I could have imagined...wow, where has that come from?"*

The ability of CAD-based tools to impede ideation progress was mentioned. Stacey (N, 2017): *"on Cad it's really slow doing this kind of stuff - they don't quite believe me I don't think."* Similarly, Lawson, (2017) noted *"you are trying to work out an idea, the form and the detail and CAD slows you down."* However, the use of new digital sketching

hardware was considered beneficial. Lerpiniere (2017): *“they can draw onto the computer, but that’s different then expecting the computer to do it for you, because you’re still manipulating the media, it’s just with a Wacom tablet rather than a pencil.”*

Fitton (2016) referred to the commonly observed student preference for digital tools over traditional sketching: *“once their CAD skills become proficient enough... the process of design is done entirely on the computer, which is infuriating and challenging.”* Powell, (M. 2017) observed, *“when people start to do stuff in 3-D, people get very fixated on the software.”* He referred to the visual pedantry of programmes, believing these fostered an unhealthy focus on aesthetic: *“we do get that sketch inhibition in relation to, ‘oh my God, it has to be perfect,’... part of that is driven by the rise of Photoshop.”*

In contrast to the natural trail of development created by manual sketching during ideation, mention was made of the problematic issue of digitally archiving the design process. This came from Leblanc (2017), referring to the default losing of the design history during development: *“digital tools are sometimes not good unless you are doing them in a way so you can keep each time, each iteration, and then you can put them all up on the wall and then look.”*

4.5. In conclusion

The data from educators created the largest body of information of the entire study. From this, the following conclusions were drawn which will be used to fulfil the objectives.

The macro-functions of the sketch during ideation - for cognitive support, communication, development and decision-making - were confirmed widely. Its function as a language was also endorsed, together with its speed and discipline non-specificity. Despite this, the micro-functions of the sketch and the micro-activities of ideation that it supported were not mentioned, suggesting a possible gap in awareness among educators.

The existence of sketch inhibition was confirmed explicitly by subjects - its extent varying according to the institution from which they came. Regardless of this, either a majority or a significant minority of students demonstrated symptoms. These included a lack of and poor quality sketch output during ideation, subsequently affecting the quality of design, a generalised lack of development process and attempts to disguise inhibition using other materials and processes including digital tools.

The attitude towards sketching of inhibited students was similar to that of the layperson: that sketching was a talent and not something that could be learned. The misapprehension of its purpose during ideation was prevalent, as was a lack of understanding of the importance of development work. A generalised lack of confidence around the sketching tool was demonstrated, and the skewed perceptions among sufferers were interesting: some of those who believed they were inhibited actually producing very effective sketch output.

Inhibited behaviour was exhibited through the need for perfectionism in output and focus upon artefact as opposed to process. Overreliance on textual and verbal information, in some cases in complete replacement of the sketch tool was symptomatic. Non-compliance towards instructions, including avoidance of engagement in sketch-based activities was evident. Inhibition was masked by several behaviours including absence from teaching sessions, apathy, preciousness, superiority and defensiveness. Determination amongst a minority of individuals was identified, these successfully engaging with self-directed activities during outside term time in order to improve their skill set.

Lack of maturity and life skills were cited as causal, and symptoms included an inability to accept and use constructive criticism. Gender was considered relevant to inhibition by some subjects, although the data relating to this was very mixed: immaturity and gender roles playing out in such instances. The importance of peer relationships was evident, providing support to sufferers within groups of their own type, but impacting their inhibition when placed in groups with mixed ability. The

need for acceptance provided a platform for compliance during teaching, individuals seeking to be part of the group activity and thereby likely to participate. Cultural issues appeared to affect levels of inhibition, and although variation in drawing ability was identified, this varied according to the experiences of the individual subjects. Despite this, the notion of the sketch as a pan-cultural language was observed.

Educational issues, from primary to higher education, had a massive impact upon existence and extent of sketch inhibition. Reduction in drawing activity among preschool and younger children over recent years was identified as detrimental to fundamental skill set. Primary and secondary education appeared to place too much emphasis on appearance of output - the artefact as opposed to the process it embodied. The national curriculum focus upon STEM subjects and constant testing of pupils had appeared to reduce levels of creativity and force such subjects out of timetables.

The art syllabus throughout secondary education was widely criticised for its ineffectiveness, providing an overambitious syllabus that did not separate the processes of design and fine art effectively. Even within art and design subjects, the general consensus was that fundamental skills including drawing were not being taught and as a result students were not gaining the skills they needed. Preciousness towards the artefact was again identified, sketchbook output for exams relying on neatness rather than quality of process. Additionally, the development of non-traditional A-level art and design subjects, (textile design as an example), had defocussed attention from the acquisition of quality skills.

Of pre-university education, the traditional A-level plus foundation course route was considered the most effective for preparing students higher education. Further education was criticised for offering poor quality courses and imparting a lack of effective basic skills, including drawing. The impact of inspirational individuals upon pupils was beneficial for creating interest and dedication towards specific skills.

Higher education institutions still required clear evidence - if not of ability, then of potential and willingness to engage in sketching and drawing - during the recruitment process. Disparity between courses was evident, some requiring a much higher standard upon entry than others. The notion of higher education as a commercial entity was clearly evident and unpopular. The pressure to recruit greater numbers and thereby less capable students over recent years had affected standards, inhibited individuals more likely to leave without skills they needed for employment.

Teaching of sketching and drawing within higher education presented an ongoing issue between art and design approaches. Formal skills were generally taught early on, usually during the first year of courses after which no further formal teaching was given. A lack of formality, the expectation that students would develop their own skill set and be responsible for their own skill acquisition was also evident. Project-based activity was heavily relied upon for the maintenance of sketching skills - as was out-of-term activity among determined, self-directed individuals. The importance of observation skills to the designer were noted, but not widely, suggesting another possible gap in awareness among educators. The separation of design and visualisation within the syllabus of design courses was in many cases unclear. A lack of transparency between the two activities appeared to exist, the need for clarification within modules necessary.

Specific teaching tools beneficial to the reduction of inhibition included group and shared activities where social compliance put pressure on individuals to participate. Sharing sketch material and the resultant loss of ownership reduced the sufferers' perceived need for control over their work. Tutor engagement during practical sessions appeared to have an encouraging effect upon inhibited students, as did the use of warm-up exercises. During teaching sessions, demonstration of sketch material from previous students had an inspiring effect, as did group analysis and critique, where again, peer pressure and support was used as a driver. Among the most resistant inhibited students, exposure to research material relating to the benefits of sketch activity endorsed its relevance and overrode their protestations, as did an assertive

teaching style. Additionally, gamification of teaching sessions appeared to reduce inhibition and create a more experimental and informal atmosphere.

The issue of tutors without drawing skills of their own, having received no formal training was a serious issue. In not having those skills to pass on, an entire future generation of designers were being denied the possibility of maximising their potential. Although a thorny issue, (no design tutor would like to admit their inability to draw effectively), it offers the opportunity for this to be addressed.

Physical teaching environment was of interest - reduction in formality reducing inhibition. Imbuing sketch material into the environment appeared to have a positive effect as did the constant presentation of work being produced. Site-specific teaching was of benefit, creating variation and utilising real-life scenarios – this approach potentially benefitting specifically architecture or disciplines concerned with three-dimensional solutions. Changes within recent years, particularly as a result of the ubiquity of digital tools, appear to have changed the nature of the studio, students more likely to work in isolation, this having an inhibitive effect.

The benefits of quantity suggested that more was better – a recurring theme among subjects and one often met with resistance by students. Although production of large numbers of sketches was observed to be beneficial, quantifying this was not straightforward and open to interpretation. An optimum timeframe for brainstorming during ideation sketch production suggested thirty minutes was an absolute maximum, after which brain function would decline. The need for speed in sketch production was cited as beneficial for reducing inhibition, such a nonprecious approach resulting in a reduction in self-consciousness.

Pastoral support was important, the relationship between student and tutor important in cultivating a positive attitude and the benefits of praise having a profound effect on students. Although sounding Draconian and contradicting the inclusive ethos of higher education, enculturation of design students, appeared, (strangely), to have its

benefits. Encouraging individuals to improve their skill sets in order to achieve acceptance within their chosen profession, may have a similar effect to using group scenarios to encourage compliance.

Permanent mark making tools were beneficial to reducing preciousness and hesitancy. Nonprecious and cheap substrates including cheap paper were also endorsed; sheets preferred over traditional bound formats for their ability reduce inhibition: the sketchbook increasing anxiety among inhibited users. Transparent substrates reduced the sense of finality, and working in large-scale was endorsed, again for reducing preciousness. A non-purist, composed imagery approach was also beneficial, using a combination of materials and found objects, thus reducing formality in output.

Digital tools were a bone of contention, their benefits to the design process clearly evident, but proving problematic particularly among inhibited or less able students. The erroneous notion that computers could ideate was common, tutors identifying slick visualisations as a smokescreen for poor design or lack of ideation, inhibited students typically deferring to these at their earliest opportunity. The inability to archive the development process using digital methods was problematic, as was wasting of time caused by their use: this was interesting and the complete antithesis of expectation. Repeated acknowledgement of the inability of computers to replace specific manual activities, represent ideation information effectively and offer cognitive support was not unsurprising.

Finally, the three-dimensional model was discussed widely, its value seemingly not to be underestimated. Blurring between the 2- and 3-dimensional seemed to benefit ideation, and could provide particular support for the three-dimensional disciplines; architecture, interior, and product design - enabling the representation of mental imagery when sketch inhibition would otherwise hamper. Such 3-dimensional models could be analysed and converted back into 2-dimensional imagery, this supporting existing mental imagery and allowing for further development.

Chapter 5: Interviews with Industry Influencers

5.1. The sample

Participants were as follows: *Dick Powell* (Founding partner – Seymour Powell – product design & innovation), *June Lawlor* (Director – June Lawlor Associates – fashion buying consultant), *Jan Faulkner* (Director – Haley Sharpe Design – commercial interior & museum design), *Jeff Kindleysides* (Director – Checkland Kindleysides – commercial interior & retail design), *John Roycroft* (Principal Engineer – BDP - architecture), *Martin Witts* (director – Sosna Witts Design – interior & workplace design), *Max Milburn* (Director, retired – MLT Architects - architecture), *Nick Vessey* (Managing Director – WMP Creative – product design), *Peter Phillips* (Director – Transparent Product Design – product design), *Tim Court* (Director – PDD Group – product & service design & innovation), *Jono Mawford* (Director – Z Solutions – 3D design & media production), *Anonymous 2* (Senior Designer – digital marketing company, Ipswich).

The cross-section of disciplines is acknowledged as heavy on product and 3-D designers; however, this was unavoidable due to limitations of availability and willingness to participate. The raw data is presented in transcribed form in Appendix 7.

5.2. Meta-analysis of the interview data

A total of 22 thematic nodes were created during initial open coding. The most prevalent theme was that of 'Industry requirements' which were discussed by 11 of the 12 subjects and produced 100 codings. This was closely followed by 'Drawing' discussed by 11 subjects, gathering 54 codings. 'Inhibition among graduates' was discussed by 10 subjects and offered 45 codings. All subjects provided data regarding 'digital issues,' eliciting 45 individual codings. The smallest themes included 'Gender,'

and 'Speed of working,' each considered by a single subject and producing one (albeit significant) coding each.

The sketch used to support axial coding during this process (see figure 25 below) illustrates emergent categories and their relationships.

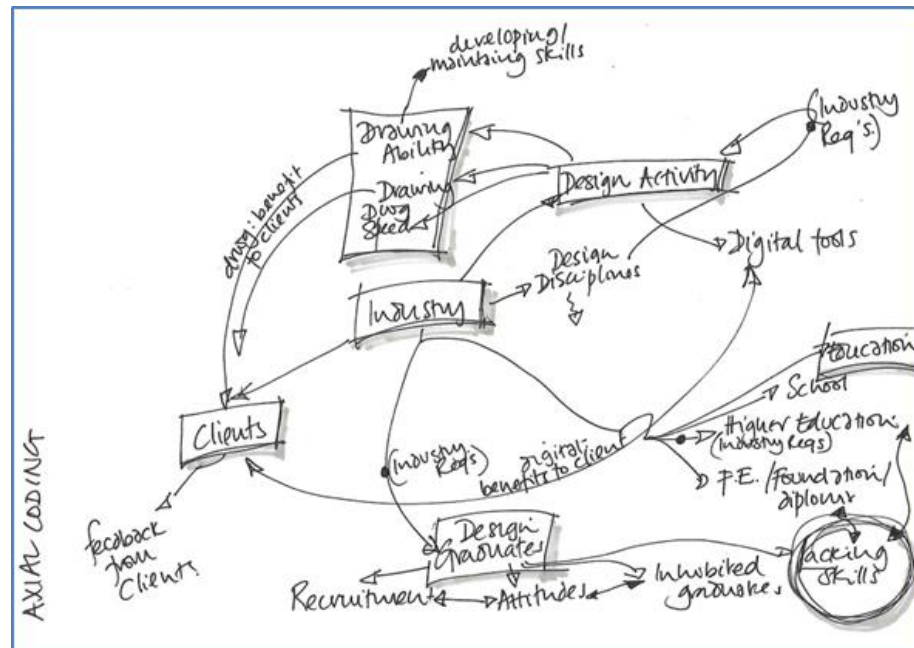


Figure 25: Axial coding of emergent themes from the data. Source: the author.

5.3. The findings

5.3.1. Industry requirements

Subjects were clear about the needs of their respective disciplines, and sketching ability was cited as a vital skill. This was particularly relevant considering Powell's (D, 2017) observation that "the U.K.'s creative industries contribute more to the economy than the financial sector," adding, "the quality of sketching amongst designers has fallen through the floor." When asked to consider the causes of the reduction in manual sketching, he replied: "it was the arrival of decent CAD systems, you know, probably fifteen years ago."

Subjects were in general agreement: *"I think it is really important to be able to draw...I have always found it very compelling and very powerful,"* (Kindleysides, 2017), *"youngsters need to be able to sketch,"* (Court, 2017). *"Is hand drawing important? Yes it is in my opinion,"* (Lawlor, 2018), *"every company that I have worked at, sketching has being important...everyone on my team recognises the value of sketching"* (Roycroft, 2017). Powell (D, 2017) noted the pre-digital-age position of sketching: *"you couldn't have got a job if you couldn't draw,"* adding, *"the need for it is more important than ever, mainly because it's dying out."* The crucial link between drawing and design ability was noted by Witts (2017): *"I've never yet met a designer a good designer that couldn't draw... it was an anathema that you could ever become a really high-level practitioner in your field if you didn't have that skill."*

Cognitive support provided by the sketch was cited by several subjects: *"sketching and drawing is so important is in the creation - not in the presentation,"* (Powell, D, 2017), *"the initial stages of a project... that is traditionally done with a pencil and paper,"* (Court, 2017), *"it shows... thought processes, how they work and how they develop,"* (Mawford, 2016), *"that thinking process... is important to me,"*(Faulkner, 2017).

As such, the sketch was identified as an essential tool for communication. Witts (2017) identified a unique ability among designers - they *"have this ability to communicate visually where others don't. So with the language they use they can paint the picture that enables someone to see something that they otherwise would... have no access to."* Powell (D, 2017) observed: *"as a tool that designers have to articulate ideas to themselves and to others, the sketch is as important as it's ever been."* Subjects confirmed its importance for this purpose: *"You need to be able to draw to a level where you can communicate either to a client a supplier,"* (Kindleysides, 2017), *"it's hugely importantly that designers can communicate to their clients as quickly and as clearly as possible,"* (Faulkner, 2017). The quality of such communication was considered less important: *"we are not really looking for finished pieces of work - we are looking for a communication tool,"* (Roycroft, 2017), or, *"a level of ability that you can communicate your ideas in,"* (Kindleysides, 2017). Faulkner (2017)

concluded simply: *"I have no hang-ups as to how good or bad drawing skills are - I just think it's that ability to communicate."*

Several subjects cited the importance of sketching within a suite of design skills: *"conceptualising, drawing and following it through all the stages... a designer who can commercially conceptualise and create a product... (it) has also got to work, not just look good,"* (Lawlor, 2018), *"they have to do it all, that's how we've always worked,"* (Kindleysides, 2017). Court (2017) suggested a reason for needing a wide skill-set: *"if time is pressing it's actually quite difficult to suddenly bring somebody else in towards the end... because they lose the understanding of project."*

Other subjects, by contrast, championed specialist skills: *"if you are a three-dimensional designer than you need to be able to draw in perspective and draw three-dimensional objects,"* (Kindleysides, 2017). Powell, (D, 2017), described Seymour Powell's approach: *"rather than have one designer do a whole project from start to finish... we have specialist skills."*

Visualisation was one specialist skill considered by subjects. This was often the domain of individuals who were not necessarily the best designers, *"you get the rush to a conclusion type who are itching to just show how good the rendering is going to be,"* (Kindleysides, 2017), and, *"we have in-house visualisers who can artistically draw way better than me,"* (Faulkner, 2017).

Specific design skills were only part of the story: subjects described other skills required of their designers, intellect being one. Faulkner (2017) described a good designer: *"the first eighty per-cent is intelligence and... the ability to communicate those ideas to the client and to the design team... clarity of vision and clarity of thinking and communicating."* He also described the levels of competition that designers faced to make it as successful practitioners: *"they are in the top five per-cent... because they are creators and they are academics - they are bright people."*

Inter-personal skills appeared as important to industry as design skill. Faulkner (2017) stated: *"the personality side is huge when you are interviewing somebody."* Similarly, Vessey

(2017) noted the benefit of such skills: *“you feel confident that you can at least invite them into a presentation with a client without it jeopardising the relationship.”*

Commercial awareness was mentioned by Anonymous, (2017), current graduates being, he believed, more commercially astute than he was as a new recruit. Faulkner (2017) described the need for designers to be financially astute: *“as quickly as you can make a decision or communicate an idea... it’s hugely important because the more time you waste exploring things the less viable you’ll become as a business as an individual.”* Similarly, Vessey (2017) stated, *“you can’t carry someone for very long if you don’t see the potential there.”*

Enculturation was important to one subject. Witts (2017) stated that skill-set enabled graduates to integrate with the design community. He looked for this during the recruitment process: *“We have made this critical judgement of whether they are part of our group or not because of that ability.”*

5.3.2. **Recruitment**

Lawler (2018) described how the increase in design graduate numbers appeared to benefit industry: *“the selection pot has got bigger which gives you the opportunity to select the very best talent available.”* Sketch ability was regarded highly during this process - Faulkner (2017): *“if I see a portfolio and it is strong on hand-skills... I want to see this person and see what makes them tick.”*

Evidence of a lack of design process within the portfolios of inhibited graduates was evident. Faulkner (2017) described a typical job applicant: *“they are very proud of their technical drawings and their plans... what they don’t show me is the process... rarely do they bring sketchbooks.”* Phillips (2017) described the ideation phase among inhibited graduates as being missed out completely. For these reasons, some subjects used a drawing test during interview. Lawlor (2018) described, *“creative directors who will give a pencil and paper and a quick brief in the interview... and they should be able to sit there and sketch.”* Powell (D, 2017) also described, *“a drawing test... you look at someone’s portfolio*

then give them a pad and paper... and ask them to draw one of their designs." He maintained this provided a useful insight into the applicant's ability and avoided instances of fraud: *"it tells you, first of all, can they draw, can they articulate an idea... it also tells you did they do it, because if you have created something then you never forget it."*

Vessey (2017) referred to the rawness of graduates: *"we wouldn't expect them necessarily to be the finished article... there is enough there and that it's worth investing that time in training them up."* However, Faulkner maintained the ability to draw was often a deciding factor in making a job offer, Powell (D, 2017) concurring: *"when we see somebody who can draw and they have the other design talents that we need, they always get the job, always."*

5.3.3. *Sketching and drawing*

Roycroft (2017) described the accessibility of sketching, believing it was within the grasp of everyone: *"the perception will be... it's a talent and not a skill, and I wanted to sort of battle that... I don't believe there is anybody who can't learn the skill of communicating via sketch... just having the confidence to draw a couple of lines,"* (Roycroft 2017).

Subjects considered the relationship between creativity and sketching. Powell (D, 2017) believed drawing ability being *"very closely tied to the ability to create and design. Creative people... are fluent with ideas, you can visualise things quickly enough to have a conversation with yourself... If you can't draw you can't have that conversation with yourself and others."*

The sketching tool was cited as a driver of the creative process by Anonymous 2 (2017): *"in terms of ideation the most effective way is to draw, to sketch it out, even if... you're not traditionally trained as an artist or illustrator... get those ideas down in a sketch format, just to get your mind thinking."*

The creative process benefitted from group input: *"where we've done projects in groups and we sit around and actually sketch stuff, they've been really successful and they have definitely produced the best creative and innovative results,"* (Anon2, 2017). Similarly, *"we all sit around the table with our sketchbook in starting this whole process,"* (Vessey, 2017).

Court (2017) suggested the group input also reduced pressure on the individual: *“two or three people participating often leads to better answers than somebody stewing in a corner by themselves.”*

The cognitive support offered by sketching was referred to by several subjects, either directly or alluded to as part of the creative process: *“you are putting something down which triggers a thought or a way of seeing something that you otherwise wouldn’t have had and then you can move on,”* (Witts, 2017). Faulkner (2017) also described his approach: *“I run a sketchbook... a massive one... I am not drawing design, I am creating a language of thinking, of what’s going through my head.”* Kindleysides (2017) also considered the sketch as a language: *“what you are actually explaining in drawing is the strength of an idea and not the beauty of a rendering and I think that’s the power of it... they are a language of artistry but they are a language of understanding as well, it’s a shorthand thing.”* Witts (2017) described the speed of cognitive activity and how sketching was able to support him: *“the dialogue with yourself starts to flow and at its best it can be a riot and you are almost struggling to keep up with it.”*

Witts (2017) endorsed manual sketching over digital tools: *“we are in a digital age but I am really surprised at the value and the efficiency and the economy (of) analogue sketching... (it) enables you to see and record almost at the speed that you are thinking... it’s a conscious stream of thought translated into marks on paper that takes you somewhere that you otherwise wouldn’t have gone.”* As a result of this, design output would withstand scrutiny: *“you have got something that you know will stand up to an argument...you are versed in it,”* (Witts 2017.)

Witts, (2017) observed design undergraduates attitudes to sketching during teaching stints: *“They feel compelled that they must be able to pin up on a wall something that looks great immediately, and the effort is on style... It should just be a brain dump.”* He believed the aesthetic of the sketch should never be the aim: *“it is the process that you go through... when you finish the sketch and it should be... a real exercise in economy, no more lines than is necessary to get the real essence of the shape or the mechanism,”* (Witts, 2017).

The economy of sketching was acknowledged by Witts (2017): *“the fastest, most economical tool still for me... is by putting pen to paper... you gravitate towards something that is almost invariably an improvement on where you started.”* Quantity was considered beneficial, speed a factor in this. Witts (2017): *“you would put fifty ideas on the wall, less than ten per-cent would get a second chance... speed is relatively important because the more you slow down... the more you think, the more laboured it gets... it should be as quick as your thinking or your exploration allows you to develop.”*

The importance of observation was acknowledged. Powell (D, 2017) maintained, *“you learn to draw by looking at the world.”* Kindleysides (2017) also referred to good observational skills for success in practice: *“being open-minded... conceptual and aware of your surroundings, and that will lead to a memory bank of things... that allow you to either consciously or subconsciously recall it.”*

The need for practice to develop expertise was cited as important. Kindleysides (2017) described his approach: *“I did really work hard at that and out of that I became very, very confident at drawing...I draw every day.”* Vessey (2017) acknowledged, *“not everybody is going to be brilliant at drawing but they can get better... the more you sketch the better the outcome.”* Witts (2017) believed that *“once it’s ingrained it becomes... your life support.”* However, Phillips (2017) suggested that developing good sketching ability involved confidence - something that not all individuals were able to tap into: *“unless you have that confidence in the first place you don’t do it, so therefore it’s very easy as the default situation where modern students... go, ‘I can’t draw, I am going to go straight to my computer.’”*

5.3.4. **Digital tools**

Witts (2017) quantified a timeframe: *“I have seen this unfold over the last two to three decades probably, this migration from an analogue world to a digital and what the fallout of that is all about.”* He was positive about the support that digital tools offered: *“you’ve got some fantastic tools that enable you to get almost to a photorealistic representation of what*

you've been thinking about just a few moments ago," but because of this, he added, "why should you draw? You know, it's a real problem not to be able to draw."

Faulkner (2017) suggested digital tools enabled visual expression, but also noted their effect upon sketching: *"now that we have got digital design tools they all seem to be the only solution... there is a place for them absolutely, so I think that the pressure is off drawing because there are other ways of expressing yourself."* Court, (2017) warned about a misapprehension of digital tools among graduates: *"a lot of them turn up here assuming that that's the mode of communication, whereas what we actually need are those sorts of quickie and presentable hand sketching."*

Several subjects observed a lack of substance in designs created using solely digital means: *"there's too much of a reliance on technology now to produce something which doesn't have the same substance,"* (Mawford 2016). Vessey (2017) referred to his experience of graduate designers: *"I have interviewed a lot of people and when you start to question their beautiful polished designs... quite often there isn't the depth of thinking."* He added, *"the way that they compensate is they create some very primitive shapes that are easy to draw or model... creating something shiny and glossy and contextualising it... detract(s) from what the real issue is here, that you know the design isn't fully resolved."* Lawlor (2018) believed this had a detrimental effect the designer: *"I think the more technology savvy students with a lesser hand drawing ability tend to hide behind technology... (it) restricts a creative flow and consequently a development of their own 'signature' of design."*

Mawford, (2016) described the problems of graduates understanding digital tools at the cost of basic design skills: *"they come with a very strong awareness of 3-D software... they understand to a deeper level than I understand it,"* but complained that they had, *"not enough conceptual and sketching ability."* Faulkner (2017) also identified this, such individuals were employed purely on the basis of their rendering skills: *"a lot of kids can... model well a bad design because it's not thought through, and we have people like that here - they are amazing visualisers but give them a blank piece of paper, not a clue."*

Subjects raised the issue of time in respect of digital tools - such methods, in their opinions, responsible for wasting time. Powell (D, 2017) stating, *"while it might take five minutes for me to sketch something that I want to... if I had to reach into the CAD toolbox to do that... it would take me a day."* Roycroft (2017) noted that digital design had changed perceptions, there being, *"an expectation these days that things take time because of the digital elements."* Court (2017) simply stated that, *"computers allow people to waste quite a lot of time."*

Powell (D, 2017) described clients being fooled by poor designers: *"CAD flattened that playing field so they can't tell a good designer from a bad designer."* Vessey (2017) similarly bemoaned digital tools used to elevate lacking design: *"by the time we take it into CAD and then we Photoshop it, it will look polished and realistic and the client will think it's believable."*

Digitally produced images, unlike those created by manual sketching were identified for their ability to appear immutable. Phillips, (2017) referred to a specific instance: *"students go in with five designs as fully finished 3D renders, and the client goes, 'so that's it then, it's not going to change.'" Milburn (2016) cited a similar situation where the digital image failed to appeal: "younger clients like (sketches) as much as the older ones.... they were often disappointed to see the subsequent products that the computer had produced."*

Digital tools were, identified as a driver of design. (Kindleysides 2017)) noted this issue among weaker graduates, a typical scenario being, *"I would like to have that shape but it will take me an hour to work out how am I going to do that so I will compromise,"* design output from such individuals being *"governed by your knowledge of the software and not your desire and how you do things."* Lawlor (2018) considered, *"is that their real style or is technology driving their style...if they are not doing hand drawing? I think, yes."* She also identified a cultural issue that could affect output: *"many of the students from China and Japan are extremely tech savvy,"* their manual sketch work often being weaker. (The possible significance of culture was mentioned here by Powell (D, 2017) who had noted

fear among certain international graduates: *"I've seen certainly in a lot of Chinese and Taiwanese students, they've got the ideas but they're just petrified to get them out"*).

Subjects considered digital sketching tools. Faulkner (2017) believed they made the sketching process more accessible: *"I am on a conference call, so I am sort of drawing straight into the iPad."* He was positive about the input mechanism and compared this to traditional materials: *"the pen... is probably the best stylus, the pressure, it's soft, it doesn't have the same resistance as on paper but it just allows me to do a whole bunch of stuff."*

5.3.5. *Sketching and designing*

Phillips (2017) acknowledged a typical experience: *"it is very rare when you do see a student who can sketch - it's lovely isn't it?"* Graduates' inability to draw was referred to multiple times by subjects. Faulkner (2017) was asked, *"what sort of proportion of applicants make you go 'oh, they can draw?'"* His response was, *"less than five per-cent."* Kindleysides (2017) maintained that design involved engaging in spontaneity and this was *"restricted by people who can't draw."* Powell (D, 2017) believed the inability to draw often stemmed from childhood, *"my kids all draw, but they draw because I draw... when they went to school they showed an interest in it and got encouraged in it, but most kids do not get encouraged."* Mawford (2016) proffered a cause for lack of sketching ability: *"you see children eating with their hands, they don't use a knife and fork, they use a keyboard rather than holding a pen."*

Of sketching ability in general, Court (2017) observed *"it's declined although now and again you get some really good ones... a lot of young designers don't see the need."* Powell (D, 2017) maintained that children were not engaging in manual techniques as they had in the past: *"kids are no longer taught to draw... if you have an ability to draw, you're at a huge advantage... lots of people can draw on CAD systems, not many people can draw."* Faulkner (2017) described the output of such individuals, believing it had far reaching effects for their future: *"they are like 12-year-old's drawings, there is no confidence... I feel sorry for them because as designers we live for the aesthetics... communication (and) problem solving."*

Court (2017) elaborated: poor graduates *“couldn’t print neatly and they couldn’t spell... they certainly couldn’t get arrowheads to line up, they couldn’t get corners of lines to join.”* He described how digital tools benefitted such graduates: *“along came AutoCAD which meant we could all then start releasing good quality professional drawings so that sort of evened the lumps out.”*

Powell (D, 2017) observed *“a relationship between inability to draw and inability to conceptualise.”* This was noted by other subjects, endorsing the intrinsic relationship between the two skills. Faulkner (2017) observed: *“that ability to think and design... that thought process is something that they lack.”* Milburn (2016) described: *“the ability to see things, the ability to have a three-dimensional concept of things. I’m surprised how many young students we got didn’t.”*

Phillips (2017) described a lack of comprehension about the design process among graduates: *“ninety per-cent of them just don’t get it, just don’t understand it. Every now and again you will get one, I saw one yesterday... she just gets it and she understands it.”* The result of an inability to design effectively had ramifications for output. Faulkner (2017) described a conversation with job applicant: *“‘I can do 3D studio,’ so I am like, ‘great, what are you like as a designer?’ ‘Well yes, I can visualise.’ ‘No, that’s not designing, that’s a different process,’ - and they don’t get it.”* Kindleysides (2017) similarly reported *“there seems to be a kind of a focus on the finished concept of what they’re trying to achieve... an emphasis on being too perfect and too polished.”*

A wider issue, lack of exposure to practical problems was identified as being a possible factor in poor design ability: *“a younger generation don’t have what we would call a ‘Dad Skill,’... the very basic practical skills and recognition and understanding of tools and how things are put together,”* (Kindleysides, 2017). Similarly, Faulkner (2017) proffered lack of life experience as a reason for weak design ability among affected graduates: *“their inspiration for ideas and creativity might be a shallow pond and it doesn’t mean that they are less creative, it just means they don’t have that.”*

5.3.6. *Inhibited graduates*

Subjects discussed reluctance towards sketching among inhibited types. Powell (D, 2017.): *“they don’t like drawing in public that’s for sure.”* Faulkner (2017) referred to a lack of application: *“a couple of years back we employed about six graduates and four are still with us - and the two that left, they just couldn’t be bothered.”* Phillips (2017) identified the self-fulfilling aspect of inhibition: *“people say that they can’t and then they don’t do it... and if you can’t, you tend to just never go there.”*

Witts (2000) believed a lacking skill-set among affected graduates was, *“almost certainly a product of the accumulative experiences that they’ve had, but it’s almost certainly rooted in the fact that they haven’t been taught correctly.”* He described the designer’s skill-set as ‘default skills’ and complained that younger graduates were going without them: *“it’s just not been introduced and it’s not been developed then that is quite worrying, (it’s) not their fault.”*

5.3.7. *School & further education*

Mawford (2016) stated: *“there’s a root problem with drawing at school.”* Roycroft (2017) suggested that drawing and sketching should be taught at this stage otherwise, *“by the time (students) get to university... you try to change things that are completely ingrained.”*

Powell (D, 2017) also recognised the responsibility schools themselves had in developing ability among pupils: *“it’s all down to the school... (if) they go through school and they never pick up a pencil, they are never going to be a designer.”* He extolled the benefits of design technology on the curriculum *“we’ve had DT in schools on the national curriculum since Kenneth Baker, probably 1998, and that was a mega move in terms of putting DT in schools.”* He described this as being, *“the mother lode of potential for people going into universities and art schools to study art and design.”* The current situation was, he believed, less rosy: *“over the last three years, that has been cut down at the knees by Michael Gove... its funding is cut... and it’s dying on its feet.”* He cited the new International Baccalaureate as discouraging students from studying creative subjects, describing a:

“mega effect on the intake into design colleges over the coming years (that) will diminish this country’s capability to be a creative power house.”

The effect of individual teachers in encouraging sketching was acknowledged. Powell (D, 2017) noted their importance: *“if you get a kid fired up about drawing while he’s at school... they will go to art college and they will pursue their career... I’ve seen some fabulous art teachers in schools persuade children they can draw... and they get set on a career then, because it’s so rewarding.”*

Further education was discussed. Subjects appeared to be in agreement that both A-level art and art foundation courses were of great benefit to students coming into HE. Mawford (2016) noted those attending FE college: *“you can tell an A-level student if they’ve done art... but some of the students that come up through the ranks of college... they manage to skirt around the ability to draw.”* Phillips (2017) identified maturity in students who had completed a foundation: *“they are that year older and I think that makes a massive difference,”* adding that their skill set was also improved. He also maintained that students without a foundation were at a disadvantage on degree courses: *“if you let four or five through and they are in a cohort of sixty or seventy students... those who haven’t done it will just struggle from day one.”*

Methods for maintaining sketching and drawing skill within consultancies were discussed, Roycroft (2017), on one occasion asking his staff to, *“illustrate your journey to work or your day.”* Staff were encouraged by Faulkner (2017) through a mixed approach: *“you need to put down... keywords or diagrams - anything that communicates what you are thinking... the very fact that they are drawing or representing their thoughts... it’s not a huge lead then for them to actually try and draw it.”* Roycroft (2017) described the benefits of a timed exercise: *“we get five minutes... two or three minutes is the better one because people lose their inhibition and just crack on.”* He described his feedback to one participant: *“this is amazing because I could see all of your thinking on this sheet... at any level or profession, that’s what we want.”*

5.3.8. *Higher education*

This was contentious for many of the subjects who provided a good deal of data on the issue. Powell (D, 2017) believed *“people who can draw... you to see more of them from colleges and universities abroad than in the UK.”* Roycroft (2017) maintained that *“a lot of the Universities do not teach people how to sketch.”* Witts (2017) believed education was neglecting sketching: students *“have not been schooled in what good sketching is all about,”* describing them, *“trying to move forward with the brakes on and they don’t know why”* In such situations, he believed, *“you don’t know what you don’t know,”* so individuals trying to remedy their lack of skill would find it almost impossible to do so.

Disparity between institutions was referred to by subjects, the attitude towards, and tuition of sketching varying hugely. Powell, (D, 2017) suggested the attitude of a single tutor could impact an entire institution’s approach: *“certain colleges often produce students who are good at this because they’ve had a tutor there who thinks it’s important.”* He added, *“if you have a tutor who can draw, they will talk to you about how important drawing is, and if they don’t, they’ll say it’s not important.”* Witts (2017) felt institutions were responsible for failing students: *“I don’t believe the quality of students has deteriorated in anyway whatsoever - it’s the course that’s not right.”*

Among those subjects with involvement in higher education, the syllabus of courses was of concern. Phillips, (2017) maintained courses didn’t listen to industry. He described a commonality among institutions: *“a drawing phase in the first year,”* but felt this was inadequate, suggesting, *“they want to build on that or maybe go for a few more weeks, just to try and get sketching back into the skill set.”* Vessey (2017) observed institutions paying lip-service to the skill: *“it needs to go up a level in the syllabus... it’s a really important part of the module,”* suggesting it should be, *“well-structured and more meaningful... and not just doing for sake of doing it.”*

Witts (2017) referred to his own experience of college to illustrate how attitudes towards sketching had shifted: *“the number one message was draw: draw, draw, draw and then when you finish, do some more drawings... It was relentless... it just never stopped, but*

boy did we turn out to be different after that very green kind of rookie first period in the opening few weeks, months.” He recounted an example of an inspiring tutor: “Alan Padgett... at Central St. Martins... he said, ‘if you are awake you should have a pen in your hand, you should just be drawing all of the time.’” He also observed that, historically, within institutions, “the principals, they could all draw, they came through Art School... prior to the ‘80s, when you absolutely had to be able to put things down on paper.” He maintained that since then, “a change has gone on, unquestionably.”

Vessey (2017) observed: *“there don’t seem to be classes where they bring someone in to teach ... perhaps they will have to find their own way of doing it but I just couldn’t believe that wouldn’t be an important part of the module.”* Witts (2017) described how students were devoid of a *“good lecturer... able to... step in and encourage and nudge the process or open it up where it might have got blocked.”* Powell (D, 2017) described how motivated students could take responsibility for their skill shortfall: *“YouTube videos... will teach you stuff and make you better and quicker... the more you do it the better you get.”*

The recruitment of students onto design courses was discussed. Witts (2017) referred to the decline in sketching standard since his time in HE, stating, *“most of us that turned up at Central (St Martins) were actually pretty good.”* Vessey (2017) echoed this, bemoaning a decline in rigour during recruitment: *“it just doesn’t seem to be as critical now in terms of how universities recruit students. I don’t know if they even have interviews now...when there are so many students... it’s impossible.”*

Phillips (2017) described the university sector as big business: *“their primary objective is to get kids on the seats paying nine grand a year.”* He illustrated a worrying trend with ramifications for students and industry alike: *“you have got to recruit... the easiest way to do that is generate more courses, and try and get bums on seats... I don’t know whether that course-generating idea is actually based on what industry wants or whether it’s just a case of going, ‘well, hang on, we can do that because it’s a bit of this and a bit of that,”* resulting in the development of *“pseudo design courses”* with little value. He referred to a particular institution he had taught at where the majority of students were international, funded

by their wealthy parents, *“what struck me it was... its heart and soul had been lost really, just sold out - they needed the money.”*

Cohort size was also of significance. Vessey (2017) maintained that, *“when you have a hundred students, there are always going to be a handful that stand out,”* however, weak students *“struggle because of the sizes of the classes.”* He reflected upon sketch work produced by a cohort of a hundred students: *“it feels like they’re just going through the motions... they’ve ticked the box and they can move on.”*

5.3.9. *Client issues*

Involvement in the design process appeared to be important to the client, and sketching allowed for this. Powell (D, 2017) suggested that clients were savvy when choosing designers, drawing ability often a deciding factor: *“clients can tell a good designer from a bad designer... by the quality of his drawings... they could see that they clearly know what they’re doing.”* Powell (D, 2017) described the power of sketches in forging client-designer relationships: *“generally, they find it awe-inspiring... you could do something that they can’t, your basic skill is quite beyond them and they watch because they’re so gobsmacked to see something come to life so quickly.”* Faulkner (2017) referred to sketches as, *“power in the meetings, because the clients are always, ‘what’s he drawing, what’s the solution like?’”* Powell (D, 2017): *“very often they want to be involved in the process, so where they might only see three CAD renderings... we like sharing with them all of those sketches... so we often take them through all of those other alternatives.”* Anonymous 1 (2017) described a particular type of client organisation for whom sketching was crucial: *“high-end industries... trailblazing... they want something that’s going to put them out there above and beyond their competitors.”*

Design development during client meetings was described by Faulkner (2017) who often found himself, *“dragged into meetings because nobody else can draw, so I am sitting there drawing stuff, and then, ‘oh, can you develop this, can you develop that?’”* Court (2017) referred to a similar process: *“they want different ideas, they want loads of them... they can*

participate and go through the journey with us.” Kindleysides (2017) described this process with clients as “leaving enough kind of space... you are not locking anything down.”

Fast turnaround was a benefit that sketches brought to the client/designer relationship. This appeared to convey the impression of competence and trustworthiness to the client; that their project was in good hands. Roycroft (2017) described how a simple sketch could reinforce the relationship: *“when you respond within the same day, sometimes with a quick sketch... it’s like, ‘thank you, this is amazing’ ... it’s fast turnaround... the fact that you’ve done that for them, it carries a lot of weight.”* Faulkner (2017) described the digital alternative in unfavourable terms: *“I took a whole bunch of notes and I will come back to you in three or four days and hopefully we’ve got it right: (it) just doesn’t wash.”*

Digital imagery created unreasonable expectation in the client/designer relationship. Powell (D, 2017) described clients who would, *“rather have that final image, they really don’t want to see the sketches.... and even though you may only be at the inspiration stages of something, they nevertheless want to see it looking real, even though it’s not.”* Roycroft (2017), aware of this preference among some clients, resisted where possible: *“we will tend to... push it back a bit, because the value is in the thinking.”*

5.3.10. Graduate attitudes

The negative attitudes of inhibited graduates towards sketching were discussed. Mawford (2016) said: *“they love the idea of it... and a lot of people say, ‘I’d love to be able to sketch,’ and I say, ‘well, you can do, if you try hard enough, but there seems to be an unwillingness to spend the time.”* Phillips (2017) referred to an inhibited graduate in his organisation who believed designing happened only with digital tools, *“she said, ‘I really want to learn how to use SolidWorks,’ – that’s was all she wanted to do.”* He described inhibited graduates failing to understanding the true purpose of their activity, urging them to *“just breathe it in and live it for a little while, rather than just automatically... go to the computer and bang out five designs.”*

5.3.11. Materials

Subjects described a variety of materials for ideation sketching. Many referred to traditional materials – Faulkner (2017): *“I have moved into the digital age but I still use a sketchbook. Witts (2017) preferred, “a good selection of pens, loads of paper and you will do almost ninety per-cent of projects in that format.”* Of traditional sketchbooks, he said: *“they are brilliant... they don’t need charging up, they will survive a drop test - I love them.”* Court (2017) described methods to mitigate lack of expertise: *“use a ruler if you can’t draw a straight line... use tracing paper overlays.”* Similarly, Anonymous (2017) described materials which helped with scale: *“liner pen, and often if I’m wire framing I’ll use gridded notepaper... which helps you... plot out the dimensions of a website or objects.”*

The use of 3-D models was mentioned for its ability to support presentation of the concept. Court (2017) believed: *“making a mock-up will tell you the answers quickly and might even be easier to work out the geometry.”* Kindleysides (2017) was a proponent of this method maintaining it had commercial advantages over 2-D approaches: *“every minute spent on a sketch model in white is worth ten hours.”*

Although analogue methods were familiar to subjects, many referred to combining such approaches with digital tools to create their own hybrid techniques. Powell (D, 2017) described a seamless approach to the two methods: *“the good sketcher will sketch and then take it into Photoshop to colour it up.”* Faulkner (2017) used a similar approach, switching between tools: *“I will take Sketch-Up drawings... and work into them with markers and white-out and chalk,”* adding, *“I convert this to a PDF and send it to the client.”* Sharing sketch material via mobile phone was described by Kindleysides (2017): *“taking photos of... drawings and then sending them to each other.”*

5.4. In conclusion

The findings from interviews with industry influencers offered an interesting slant on the data already acquired from educators and the literature. It was clear that sketching during ideation and throughout the design process was essential, widely used and a skill actively sought by employers. Acknowledgement of the close relationship

between sketching and creativity was identified early on and revisited by subjects throughout their interviews.

The needs of industry went beyond those of pure design ability. A high level of intellect, good interpersonal skills and some commercial awareness were also required of graduates. Enculturation was relevant - whether an individual could become part of the design community relied on them having a good level of design skill, sketching an important element of this. Organisational mind-sets were crucial in fostering a positive attitude towards sketching, its existence relying on the attitude of those at the top.

The importance of sketch ability to industry was doubtless and an increase in graduates not having the required standard of sketching and drawing skill was problematic. Sketch ability was a highly prized asset among graduates, this skill alone often securing them a position, (or at least interview) regardless of their lack of experience in other aspects of practice.

The switchover from manual to digital tools over the last few decades was lamented for creating a mind-set among graduates of sketching being unimportant. Despite this, its use had not waned within studios, utilised to support reinterpretation, cognitive activity, and knowledge growth still of paramount importance. Additionally, it provided a bridge between client and designer, forging relationships and enabling input from all players within the design process, designer or non-designer: the importance of the sketch and extent of use for this activity was unexpected.

Although all subjects were designers, there was still acknowledgement of the importance of observation sketching to their practice, suggesting that this type of drawing was not purely within the realms of fine art. Again this was unexpected and something to be further considered.

The unimportance of sketch aesthetic was apparent: as a communication tool within the studio, its economy and immediacy were valuable throughout the design process. Unexpectedly, drawing activities among design staff were useful for skill maintenance.

Digital tools were essential yet problematic. They appeared to engender reliance but were not necessarily beneficial to design quality. They were also identified for disguising lack of substance and inability within weak designers. Curiously, they also appeared to slow down tasks and were blamed for wasting time. The immutable aesthetic of digital images was also an issue, depriving the design process of potential further development. Digital sketching tools did not appear to be used very widely, but those who did use them endorsed them as beneficial beyond traditional digital tools.

The specific skills that graduates appear to lack were indeed the ability to draw, and the ability to conceptualise as a result. The decline in the perceived importance of sketching among graduates was apparent and their misapprehension of the design and visualisation activities was of concern. Such graduates were observed to avoid sketching activity and often demonstrated lack of process within their portfolios during the recruitment process, relying instead on digital images. Their attitude towards sketching was often negative, regarding it as irrelevant and outdated. The inhibition suffered by some international graduates suggested that cultural issues may influence inhibition - an issue that could benefit from further research at a later date.

Education was a thorny issue for many subjects; the decline in drawing tuition, disparity and weakness of syllabus were bemoaned. The commercialisation of higher education was believed to have created a reduction in rigour during recruitment. Its effect, including larger class size was considered of detriment to students, weaker individuals falling behind. So-called pseudo-design courses with little industrial value were mooted and blamed for producing ineffective graduates. This was accompanied with the suggesting that higher education failed to prepare students for industry. The decline of the traditional art school had left many design tutors unable to impart

effective drawing and sketching skills, (as they had none to offer) was also believed to be detrimental to students.

Schools were held responsible for their part in decreased skill, academic subjects favoured over creative and sketching and drawing pushed out of the syllabus. The role of the inspirational art teacher was an important driver for pupils who went on to creative careers, suggesting the personal qualities of the tutor were relevant to subject interest and skill acquisition. The traditional A-level and foundation course route into higher education was preferred over that of FE. The latter considered less rigorous and leaving students with lacking or non-existent drawing skills.

During this phase of research, three-dimensional models were again considered of value, their ability to presents knowledge and concepts effectively during ideation, particularly among the three-dimensional disciplines. This reinforced what had already been identified by the literature, and suggested there was clear benefit in such a method.

Chapter 6: Interviews with Students

6.1. The sample

The subjects, eleven sketch inhibited, six sketch fluent came from architecture, interior, product and fashion design. None of the subjects from fashion design, despite agreeing to take part in the study, arrived for interviews and the course leader of games design & animation was unable to provide subjects from his course. This left the breadth of the sample somewhat compromised, but it was considered to still be valuable to the study.

Raw data is presented in transcribed form in Appendix 8.

6.2. Meta-analysis of the interview data

During open coding of data from both inhibited and fluent subjects twenty-seven individual nodes concerned with sketching and sketch inhibition emerged. The code 'Teaching of sketching in HE' elicited the greatest number of codings: 75. 'Peer judgement' elicited the next greatest number of codings: 69, followed by 'Design process': 61. All seventeen participants presented data that related to 'Teaching of sketching in HE' and 'Peer judgment'. The least coded nodes were, 'Fixation', 'Ideation', and 'Record of process'. Fixation was mentioned once by only one subject. 'Ideation' and 'Record of process' were mentioned once by two subjects.

An example of the sketches produced to support the axial coding process of emergent themes and their relationships is presented below, (figure 26).

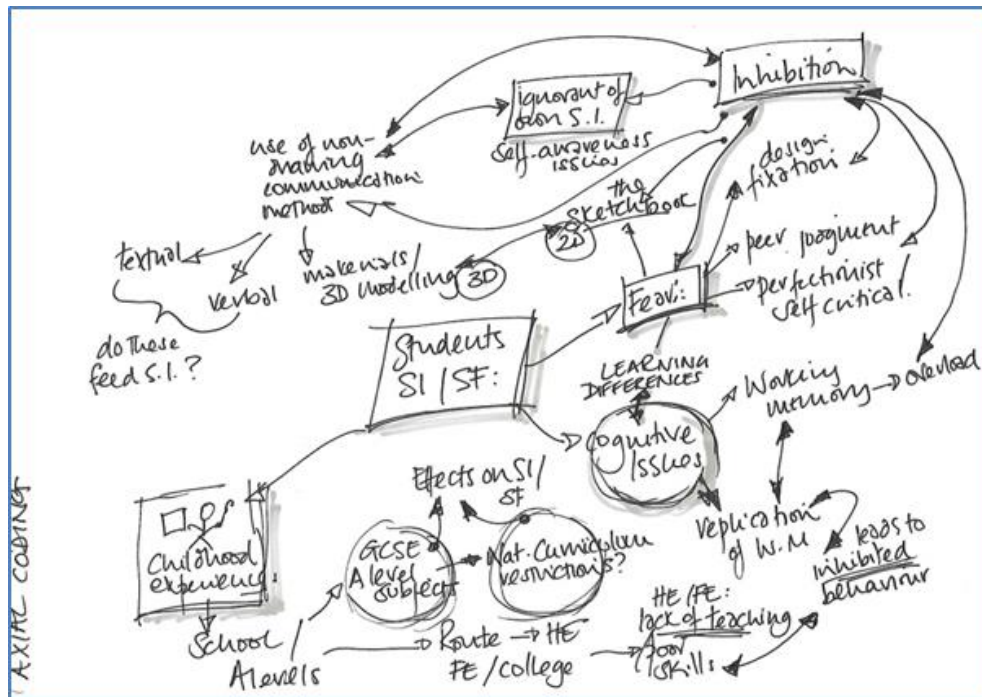


Figure 26: Axial coding of the emergent themes from the data. Source: the author.

6.3. The findings

These consider the data from both the inhibited and fluent group. Findings are structured into sections named as per the codes created during analysis. The data from inhibited and fluent groups is considered together and compared where appropriate. Anonymisation of subjects involved assigning a code, (eg, S4), to each individual to whom material has been accredited.

6.3.1. Teaching of sketching in higher education

This code emerged as the largest, all subjects reflecting on their taught experiences within HE. Perceptions were mixed, and given that all subjects were in their third year of studies, their descriptions of teaching methods were disparate, even within the same courses.

Subjects described their experience of being taught sketching and drawing during their courses. The inhibited subjects described their tuition: *"It was just a block in the first year...that had a little bit of teaching for drawing and sketching... about a month and a half of, 'this how you sketch and this how you're supposed to use a pencil,'"* (S2). One inhibited subject said of formalised teaching: *"we don't get it at all... the sketching techniques that I've got have been taken from A level"* - she also claimed her taught modules had *"nothing to do with sketching,"* (S13). Fluent subjects identified a lack of formalised teaching: *"to be honest we haven't had much in terms of, 'this is how you can sketch,'"* (S12), another concurring: *"it is assumed you need to figure it out for yourself,"* (S14). Subjects from both groups described the requirement to develop an individual approach.

Inhibited subjects also identified a lack of formal teaching: *"it's not like you do this first and then you move on to this next step, it's more like you do what you think is right,"* (S6). S4 appeared to struggle with this: *"during the concepts stage you need to sketch even though you don't know how to...I had a discussion with one of my course mates from last year and she didn't know how to draw,"* (S9). Comprehension was an issue for one student who wanted *"a lot more sketching lessons - sometimes we really didn't understand why we were doing them,"* (S8).

A more structured approach was given to teaching technical drawing skills, than to sketching - S5: *"in the first and second year we had more teaching time... perspective drawing and how to do visuals."* There appeared to be difficulty among inhibited subjects in understanding such taught material: *"there was this 3 point perspective I remember - everyone was upset that day... I don't think anyone is using it to be honest,"* (S8). Another clearly struggled: *"in the first year we got this manual technique, like, by hand for everything, but for me I find it harder because I never learned perspective drawing before, like one point, two point, three point, and I am just finding it difficult,"* (S6). One suggested maturity may have been issue of among her cohort in regard to learning these new skills: *"in the first year I don't think it was taken as seriously,"* (S4).

Curiously, three inhibited subjects provided conflicting statements about their experience of being taught. One stated, *“in our first year they will talk about how you can do quick sketches - I’m happy the way I have been taught,”* but then contradicted herself, saying, *“I’ve not really been taught how to sketch,”* (S7). Another stated she had learned *“to draw a box...a cylinder, two-point perspective, one-point perspective and so on,”* then maintained, *“I haven’t really taught like how to do things,”* (S4). Similarly, S6 reported, *“they do teach you how to do it... but then it’s not properly, so the second year you don’t get taught at all,”* then stated, *“we don’t really get taught how to draw...no I don’t think they taught me.”* Although the reasons for these anomalies are unclear, there appeared to be a belief that although they had received some formal tuition, they were still without the required skills or confidence to use them: they felt something was missing.

When asked to consider whether additional skills would be of benefit, two fluent subjects (S1 and S10) requested life drawing classes. One inhibited subject referred to his position as a consumer of HE saying, *“being frank I pay for the service of being taught...can’t we have a few sessions on how to sketch because it really helped us?”* (S16).

Both fluent and inhibited subjects wanted tuition specifically for technique with materials, (S1) stating, *“if we had someone actually come in and show us some techniques... a starter week in first year where we could just experiment with materials.”* She also wanted additional tuition to develop observation skills relevant to her practice, *“to pick a figure or...an object...being able to focus on how light would affect an object,”* (S1).

Inhibited subjects discussed difficulty with retention. One subject acknowledged the benefit of repetition as a means of reinforcing technique: *“I wish I did have...a recap...like how to get a perspective view done quickly; it would be good to go over,”* (S4).

6.3.2. Awareness of sketch inhibition

Some of the inhibited sample specifically presented themselves as being fluent - this was interesting to note despite being identified by their tutors *because* of their inhibition. It was also noted that these subjects used positive language to describe their

relationship with sketching, even though their tutors had expressed frustration at the poor standard of their output. For example: *"I really enjoy life drawing... It's a natural thing that comes to me"* (S5), and, *"I like to sketch...I am happy to sit down and scribble ideas,"* (S9). One inhibited subject deliberately used superlatives to describe her relationship with sketching: *"it's something that I love, it doesn't bother me and I love it so much... I don't mind, I actually love it, I really like it... I get really excited because I love to sketch so much... I love to draw"* (S7).

6.3.3. *Childhood experience*

With one exception, all sketch inhibited subjects described a positive relationship with both drawing as pre-school children: *"some of my earliest memories are actually from just drawing"* (S4), and, *"when I was younger I always used to do like painting of artists and of fashion,"* (S9). Two subjects described their home in relation to sketching activity, *"I always sketched and I knew that I had a passion for art from what seems like a young age,"* (S7), and *"I always loved painting, just like doing crafts at home in general,"* (S3).

Subjects related to only themselves when explaining their relationship with creative activity, appearing to be engaging in such activity alone. The exception to this was S2, who described comparison with peers: *"I always had a bad relationship with sketching... The other kids could just...mix all colours together and create a wonderful palette, and mine would just turn to green mush on the paper."*

Later childhood experiences in primary and secondary schools demonstrated a continued good relationship with the discipline: *"art was my favourite subject at school,"* (S3), and *"I've always enjoyed drawing throughout school,"* (S5). Encouragement from teachers appeared to be formative in defining a relationship with drawing: *"they (teachers) even told my parents that your daughter is a really good drawer and she is enjoying it and she should keep it up,"* (S6), and *"my teachers noticed that from like a young age, so that's what has pushed me to continue doing any art related things,"* (S7).

Inhibited subjects presented a mixed relationship with drawing as they approached GCSE art. One subject cited the teacher's focus of concern with the appearance of the artefact: *"they were mainly interested in what you ended up with, not how you got there,"* (S2). For one fluent subject, GCSE was a negative experience: *"I didn't really enjoy doing GCSE because they put a lot of focus into laying out your sketch book. It had to be very presentable and all your titles had to be very neatly written and very laid out at right angles, all stuck in perfectly, no smudges on pages,"* (S1). Interestingly, one fluent subject from architecture bypassed GCSE art, electing to study academic and technical subjects instead: *"the only time I stopped drawing was GCSE,"* (S12), returning to it once her exams had finished. In addition to teacher influence, parental pressure affected the relationship between subject and drawing. Inhibited S8 described compliance with her parents' wishes as a reason for not continuing with art.

6.3.4. *Routes into higher education*

Subjects, both inhibited and fluent took a variety of routes into HE. Of the eleven inhibited subjects, two had taken A-level art plus a foundation course, (the traditional route into art or design HE). A further two came into higher education straight from A-levels, (bypassing a foundation course), having studied art alongside two or three other subjects. Three subjects took design A-levels, (graphics, graphic products and product design), as opposed to traditional art and one subject gained a BTEC diploma in art.

Two inhibited subjects came into HE without any formal qualification in art – one studying childcare, the other business studies, the former producing a sketchbook on an informal basis and using this to apply for interviews. One described his route into HE: *"it was just a whim really that I'm here...what should I do with my time? Do I get a job that's poorly paid and have to work all the hours? Do I go to university to try and better myself,"* (S2). In total, eight subjects had received some formal art or design education, two of these following the traditional A-level plus foundation route. A further three had not engaged in any art or design education.

Of the six fluent subjects, one had taken art A-level plus an art foundation course. Three others had taken art A-level alongside at least two other academic subjects. One had trained in HM forces as an architectural technician before applying for a design degree. In addition to this, one subject had taken only academic subjects before beginning degree study. In total, five of the group had undergone some formal training in art or design.

6.3.5. *Attitudes to sketching*

This particular code provided an invaluable insight into students' perceptions - the inhibited subjects being more effusive in discussing their relationship with it sketching than the fluent group.

Some inhibited subjects expressed a lack of enjoyment in sketching, stating: *"it's probably the bit I enjoy the least,"* (S13), *"it's a bit of what you kind of have to do,"* (S6). Resistance to sketching among, often seen in studio situations, was strongly evident in two subjects in particular, both having received no formal art or design training prior to HE. (Interestingly, both subjects appeared to lack maturity in the way they expressed their views). One subject (S8), stated, *"I feel like they are quite strict, like, 'you should sketch,' but for me I feel like it depends on what type of project you are doing as to how much sketching you need to do."* She lacked understanding of the benefits of sketching, *"it was just like, 'why do we need to do it?' so it was just like part of a project, like you just had a sketchbook and you just had to bring in a book full of sketches."* Her lack of awareness led her to engage with sketching half-heartedly: *"I just don't like the sketching part, the whole development stage... I just want to do that all in one day and just get it over and done with,"* (S8).

The other inhibited subject, (S7), simply stated, *"I didn't understand why we have to do rough sketches."* She appeared to avoid engaging in critical evaluation of her processes: *"a lot of the stuff I've put in my space is not in my sketchbook, so I just skip those parts."* She perceived sketching as a *new* alternative to other tools, it *"definitely helps you to bring your ideas out there more, instead of staying on the computer like the traditional way."*

Observation of other designers' practices, together with greater self-awareness than the previous subjects, enlightened one student to the value of sketching: *"when I look at designers' work... they start from rough sketches... you start to learn and you start to realise this is what I'm meant to be doing,"* (S7). She expressed regret at having missed out on skills she now perceived as important, (having studied a BTEC in art & design): *"for me I realised later on which is kind of disappointing, but it's better now than later."* Similarly, maturity and determination were mentioned by another inhibited subject, S9: *"I've realised that sketching is so important...it's just a matter of you taking ownership of your education ... and teaching yourself to learn,"* – this realisation being made towards the end of her final undergraduate year.

Curiously, the fluent subjects provided surprisingly little data regarding their attitudes towards sketching. One subject described his relationship: *"I love it you know, I can't really explain why it's just another way of expressing what you are thinking,"* (S17). Another two gave more pragmatic responses: *"it's not the end goal at all, it's just a process just a matter of getting ideas down,"* (S14) and, *"I don't think sketching will ever die out especially for our course; it's imperative,"* (S10).

6.3.6. *Alternative communication tools*

The inhibited subjects described regular deferral to verbal information to replace or support their weakness at sketching. One subject expressed confidence in her ability to convey her ideas: *"I don't mind if it is my sketch and it's rough and it's weird, because again I have my words,"* (S3). Another bemoaned both his sketching and verbal skills, explaining a typical project: *"it'll probably end up with quite a poor quality sketch at the end of it, and some really terrible explanation,"* (S2). The need for sketching appeared to be obviated by another subject during a tutorial: *"I sat down with him, he understood me just by me speaking,"* (S9), although another felt compelled to sketch – but only if her verbalisation of concepts failed: *"if I want to design something and sometimes I can't explain it, I have to draw,"* (S7).

In contrast, two of the fluent group believed they were able to express their thought processes effectively through sketching. Unlike the inhibited subjects, they felt their verbal skills were less effective means of communication: *"I don't always explain things particularly well but I can draw it,"* (S10), and, *"I'd stumble in trying to explain my idea through my drawing, so I feel like it has to be clear and concise before I can show it to someone,"* (S11).

6.3.7. *Materials*

The fluent subjects conveyed greater confidence in their approach to materials selection, one stating, *"I don't use pencils at all, I just use a pen,"* (S14). Another preferred to use *"a mechanical pencil... and anything that I can find around me, A4 or A3 drawing paper,"* (S17) suggesting a preference for non-precious materials. Novel materials were favoured by one subject who had developed her own methodology: *"in restaurants they have the little waitress pads where they write down your order, I've ordered a pack of those because you can just do a little sketch and then rip it off,"* (S10). Subjects also engaged in re-representation activity during ideation, tracing paper as material of choice for this purpose: *"during my tutorial we got out a bit of tracing paper and we sketched over one of my drawings,"* (S11), and, *"I sketch a lot with tracing paper, so you get it closer and closer to that end result just by reimagining it and going over it,"* (S12).

One inhibited subject conveyed a vague description of her preferred materials: *"paint, sketching with pens using different mediums and pencils,"* (S8), but was unable to elaborate on their specific purpose in the process. Lack of experimentation was mentioned by another: *"I've not done any watercolour, I've not used any colouring pencils or crayon...it's mostly just black and white sketching,"* (S7). Lack of confidence with materials was cited by another inhibited subject: *"I like to use a ruler,"* (S15). Eraser use was also alluded to, S8 admitting, *"I just like, feel the need to just rub out all of these mistakes."*

In contrast, one inhibited subject described his choice of substrate as, *"a little A5 kind of notebook,"* (S16). Another expressed the benefit of layout paper in reducing her anxiety:

"it's thin so I am able to draw on top. I can do a quick sketch with a pencil or a pen... I am not scared of making a mistake," (S7).

6.3.8. *Fear issues*

This provided the second largest set of codings from the interview data and because of this, was sub-divided into further emergent issues which are considered here; judgement by others, self-criticism, perfectionism in output and fixation. All subjects, inhibited and fluent, expressed some level of fear in relation to sketching.

Inhibited subjects described their feelings when required to sketch during studio sessions. Their responses ranged from, *"worry"* (S16), feeling *"uncomfortable"* (S4), *"a little bit on edge...nervous"* (S13), *"scared...uncomfortable"* (S6) to *"absolutely terrible"* (S2), *"scared"* (S3) and, *"so scared"* (S8). One subject maintained, *"I don't feel scared...I don't get anxious,"* (S7) - this subject, despite being inhibited, had also previously described a positive relationship with sketching.

The fluent group presented similar responses to the inhibited group, their responses ranging from: *"nervous"* (S17) *"panicky...a little anxious"* (S11), to, *"dread...oh, by God, I am scared"* (S12), suggesting that although not inhibited, individuals still experienced a similar emotional response to sketching in a studio environment.

Judgement was a big issue and alluded to by all subjects. This was expressed as coming almost entirely from peers rather than tutors. Inhibited S8 reported of her peers, *"they're quite judgemental in a way,"* and this was endorsed by many subjects. S4 said she was afraid of *"making myself look a bit stupid,"* in front of them. Although fluent, S11 believed that *"a lot of people on my course...will quite often judge your presentation before they will judge anything else."*

Competition and comparison were constant themes noted by inhibited subjects: *"you do it for everything, you do it for football, you do it for your hair, you do it for how fast you can run. If you ask people they'll deny it but it is there,"* (S2). Inhibited S7, already identified as something of an anomaly, appeared not to suffer any of the anxieties expressed by the

other subjects: *"I don't get anxious I don't think about how my work is going to look...I don't think too much about what they are going to think about my work."*

One fluent subject felt that peer-reviewed studio sessions were problematic. She was also able to make the distinction between the aesthetic and content of sketch output: *"I don't like having my drawings necessarily marked against someone else's drawings or compared to them because I think it's the ideas behind those that are actually more important,"* (S12). The data alluded to a hierarchy within the studio based upon sketch ability, this expressed by a fluent and inhibited subject, respectively: *"everyone is sort of gauging how well you are doing compared to others,"* (S14), and, *"there is always that thing of you know someone else is better at sketching,"* (S16).

The fear of judgement (rather than judgement itself) was expressed by inhibited and fluent subjects: *"when you draw... you feel uncomfortable... scared that they are going to judge you...it's just what they're thinking in their heads,"* (S13), *"I have this fear of people looking at it going, 'this is a really horrible drawing'"* (S11). This fear led one inhibited subject to take action to avoid such situations: *"I never used to work in the studio because I felt like everyone was looking at my work and they were judging me,"* (S8).

Although a concern among both groups, the data suggests that negative judgment from peers was almost never heard, one inhibited subject stating, *"well, they don't say like bad remarks to my face, they probably might say it when they go away,"* (S8). However, more concerning was the response from a fluent subject from an architecture course who had received personal abuse from peers, both male and female, regarding the standard of her output: *"I've had some quite unkind comments...it would be like some really nasty things...I've been called (tutor's name)'s bitch... we all aspire to succeed, but a lot of male people on our course do not like it,"* (S10).

Issues of self-criticism emerged among inhibited subjects. Falling below an implied standard was indicated, language of self-criticism was harsh and the term *rubbish* used frequently to describe output that wasn't deemed good enough: *"mine is going to look*

rubbish" (S16), *"I feel like this is not good enough... even if you think it's good, it's rubbish,"* (S2), and, *"I ... do it and then I'm like, 'this is all rubbish'...getting so stressed about it... I was like, 'we are looking at them - they are not good, they're awful,'"* (S5). Another expressed her inner dialogue as, *"a bit of myself saying... 'I don't know how to draw'"* (S3).

Suggestibility had an effect upon one fluent subject - although confident in her ability and output, she conceded that, under scrutiny, *"if someone tells me it's bad, I'm instantly, 'yes it's bad, it's horrible'"* (S1).

The need for perfection in output was an issue for subjects from both groups. The term *'perfect'* was identified several times among subjects: *"I would think for a second how to make it perfect,"* (S4) and, *"because the tutors are looking at it I'm always making it perfect,"* (S7). A method of doctoring existing images in pursuit of perfection was explained by S15: *"I spend a lot more time trying to go around in fine liner putting a bit of shading on to make them look a bit more lifelike."* The same pressure was perceived by fluent subjects: *"I spend ages on a sketch page to make sure it's looking beautiful and expertly presented...it had to be perfect."* (S14). Another subject said he *"would link a dirty to an unpleasing drawing"* (S11). In all of these examples, the subjects' focus and need for perfection had been placed upon the aesthetic of images, their need to *please*, rather than their success in communicating information – no-one mentioned this quality.

Fixation was mentioned by only one inhibited subject, aware of its potential effect on output: *"when you are starting ideas they always say make sure you don't...get...fixated on one...concept because there's a very good chance it's not going to be the best - that you will get stuck in it and you'll just do iterations,"* (S16).

6.3.9. *Peer support*

This was identified as valuable, fluent subjects stating, *"the people I had around helped me... somebody is going to know something better than you,"* (S12), and, *"it was nice to...see their style and learn from them,"* (S17).

Comparison with peers, although a source of anxiety, also offered an opportunity for reflection and growth for inhibited subjects: *"I wouldn't say I feel like intimidated by it - I am more appreciative,"* (S9), and, *"comparing myself to what everyone has submitted, and then I'm like, I want to be as good or better,"* (S5). S8: *"people are... looking at other people to see, 'oh, that's good... I need to...switch this up to make it better.'"*

6.3.10. Cognitive issues

In general, subjects were able to describe their cognitive processes in fairly rudimentary terms, only one fluent subject aware of how sketching supported the many processes they engaged in.

Subjects from both groups described their mental imagery: *"It tends to be more in my head,"* (S13), *"I get a picture in my head, I get an image...everything is in my head,"* (S7) and, *"quite often I have words in my head or just, like, a sentence,"* (S1). Two inhibited subjects described use of their unconscious to create mental imagery: *"when I lay down, all the ideas come in from my head,"* (S6) and, *"if I sit down to sketch, I can't think of anything - when I am doing something completely not related to my project, it will come to me,"* (S15).

One fluent subject, S11, was aware of his use of mental imagery and offloading working memory. His ability to identify and describe mental processes was also more developed than any of the other fluent subjects: *"I get sort of flashing images...in my head, the idea...isn't developed enough. I struggle to make sense...of what I've got in my head... sketching helps collect them and so it gets out of my head... but it's nowhere near as developed as when I start sketching, it's almost as though there's a linear process from conceptualising in your head to extending that onto in pen and paper... once I start drawing it's almost as though the fog can go."*

Working memory issues were described by both groups. Some subjects described their use of an aide memoire to support working memory: *"I do like little tiny sketches just so I remember what I was thinking,"* (S8) and, *"there is a temptation just to make it a bullet point, even something that ...brings your mind back to later,"* (S16). Some subjects identified their

need to reduce load on their working memory: *"I've got a terrible memory...I sketch it straight away,"* (S12), and, *"in a lecture sometimes they'll be talking and you have this idea and it's like, do I listen? What if I forget? So I just draw it to get it out,"* (S8). Additionally, two subjects, one inhibited, one fluent, described a sense of urgency when externalising their thoughts: *"I will just go grab a scrap piece of paper and scribble it down,"* (S15), and *"sometimes it's just a panic to find a piece of paper,"* (S1).

Difficulty in replicating mental imagery was a significant problem reported by the majority of inhibited subjects: *"the idea that I have in my head doesn't look like that on paper,"* (S15), *"even though I can draw...sometimes when you get an image in your head...when you try to draw it out you couldn't do it,"* (S6), *"it's just getting it from my head to paper"* (S13), *"I don't feel like it's going to look as I want it to look... in my head"* (S7), and quite simply *"it can be a bit rubbish,"* (S4).

One inhibited subject, although describing highly developed mental was completely hampered by his inability to represent: *"I can visualise it in my head. I visualise exactly, I can walk through it in my head, so if it's a staircase covered in like a hexagonal polyglass pattern, I can walk through it, I can imagine the light coming through it – (I) can't draw it,"* (S2). Another inhibited subject described representing mental imagery through three-dimensional form: *"I will try and draw it out big and it won't come out...I had to make like a model for me to be able to actually draw it,"* (S8).

6.3.11. **Tutorial issues**

The literature suggested that sketches act as valuable communication tools during tutorials and this was discussed by inhibited subjects. One was very honest: *"I don't usually have any sketches to show them,"* (S2), another felt they were of benefit: *"when I am taking it to the tutors they can see exactly what is that,"* (S13).

Fluent subjects described a much less anxious experience during tutorials, one clearly engaging with confidence: *"because you've got so much to show them in a small amount of*

time, you just end up like flicking through the whole content of your book...they've always told us the more information... we show them, the more feedback they can give us," (S1).

6.3.12. *Design process*

Subjects' reliance on sketching during the design process was considered - the possibility of a difference existing between inhibited and fluent subjects. Most inhibited subjects' descriptions were perfunctory, containing little rich description: "I would probably start with some sketches or a research area," (S15), "you just sketch, like, an idea," (S8), and "a bit of sketching, which is not nice sketching it, might be just like a box, and then just some comments on how that box is," (S3).

Two of the inhibited group described their design process as relying heavily on digital methods, S16 stating: "if the computer is in front of me, it would be CAD first otherwise it's kind of a sketch." S7 also relied on CAD, her sketches functioning as a record of process: "if I am designing something on CAD software, I can always go back to my sketches and see what I've done, if for example something doesn't look right." Regarding this, another subject was asked: "you don't have a record of each individual stage, is that how you work with digital?" She replied, "Yes, I will just lose it," (S13).

The use of three-dimensional models for design development was described by two fluent students, endorsing their significance, S1 stating: "the models influence sketches and sketches influence models but I have to have the sketches first." Similarly, "I...start off with sketches, they are very crude...I tend to go from sketching to model-making back to sketching if the model is not correct," explaining, "there is an element...in 2D that you just can't tell if it's going to work," (S12).

6.3.13. *Digital tools*

Data relating to the use of digital tools created one of the larger codes from student interviews. Subjects, both inhibited and fluent, described their relationship with them – some able to do so in greater depth than for manual tools. A preference for digital methods was expressed by several inhibited subjects: "quite earlier on I go on to the

computer to sort everything out, you know onto CAD, I love CAD," (S3). Others gave reasons for their preference: "I am able to show my ideas probably more than the sketching," (S8), and, "I can just do it on the computer," (S7). Accessibility was described by another: "if the computer is in front of me, it would be CAD first," (S16). However, one inhibited subject expressed a struggle: "I find using software quite difficult," (S5). Similarly, another described her reservations towards digital tools: "I am probably a bit afraid of it," (S15).

The sense of progress when using CAD was expressed by inhibited subjects: "I prefer CAD... I feel like when I am doing the manual I'm still really behind, but when I am doing CAD it shows progress," (S8), "you have to get work done, you have to make progress, CAD I find is easier," (S16), and, "I can change things quicker and it's less frustrating," (S16). This sense of progress foreshortened the ideation stage for one subject: "my sketch phase is probably not as big as it should be, because I feel like I progress when I've seen it... 3-dimensionally," (S15). S7 described her perception of both speed and progress when using CAD: "if...I don't feel like it's working in a sketch... I would quickly move onto CAD just to quickly get the idea, because when it comes to sketching and seeing how it works, that's where I get a bit impatient," (S7).

On inhibited subject expressed how the computer could do tasks she felt were beyond her capability: "it's easy to like change colours, rub it out...put different layers on. I prefer doing that than doing the manual paper stuff, because that's a lot harder to work out as well like trying to draw a straight line, you have to use a ruler... it's just a shift and then it makes it all straight for you...and then if I don't like it then I can always change it," (S8).

That digital tools could ideate was evident in responses from inhibited subjects, one of whom maintained this allowed her to avoid all use of manual processes (S4). Another believed the computer did the designing, relying on sketching only as a fall-back: "I want to get something onto the computer, I want to design it but I can't so I will sketch," (S7), (this subject previously maintaining that digital tools were a *traditional* method of design).

The realism offered by digital tools was important to inhibited subjects: *“it’s just the finishes I can get, it’s much better than what I can get on paper,”* (S13), *“I can get a more realistic view,”* (S16). One subject viewed it as a complete replacement for manual techniques: *“because of CAD software...you can visualise stuff in a completely different way - you don’t have to sketch,”* (S4).

Non-permanence was also a perceived benefit to inhibited subjects: *“(if) I had made a mistake, (it is) easy to rub it out than start a new paper,”* (S13), *“on a computer you can rub things out easier, you can get the lines to be nicer than the ones you’re using on paper,”* (S13). Similarly, *“the computer does things for you, even though you are drawing, you can always edit,”* (S7).

In contrast, one fluent subject offered considerably different perceptions of digital tools: *“my line work can sometimes restrain me slightly; it doesn’t restrain me anyway near as much as creating something on the computer,”* (S11). On the recording of the ideation process, he continued: *“on the computer...you would be taking step back and looking at it... whereas you sort of just flick through the different sketches and it’s... easier to think through.”* He also commented on the sketch to convey both aesthetic and thought processes – something the inhibited subjects failed to identify: *“when you see a really nice sketch...you can see their thoughts more than (on) a computer ...quite often there is a beauty to hand the drawing that there isn’t to computer,”* – (this subject already presenting in-depth awareness of his design process and mental imagery).

6.4. In conclusion

The disparity between the existence of sketch inhibition and subjects’ perception of their ability was of interest and may have several explanations. Subjects may simply be unaware of their inhibition (this was certainly the case with some of the affected group). The Hawthorne (observer) effect may have influenced the data in this situation - subjects conveying what they believed they should say, rather than giving a truthful account of their experiences, (and certainly the case with subject S7). If this was the case, it raises the question as to why inhibited subjects believed they *should* describe

themselves as fluent, and suggests a degree of awareness that their ability was below an ideal standard.

The data acquired regarding routes into higher education was perplexing. Both inhibited and fluent subjects had followed the A-Level and foundation course route, or alternatives including BTEC and creative A-levels (including other design subjects), their inhibition existing regardless of this. It was, however, interesting that some inhibited subjects had received no formal prior art or design education, suggesting that this was indeed necessary for them to benefit fully from their HE experience. However, there was little definitive data separating the inhibited and fluent groups, suggesting that other factors may be significant to inhibition.

A disparity between formalised and informal drawing tuition was evident, and subjects from the same course presenting differing interpretations of their experiences. Formal teaching during the first year was frequently identified, as was the need for self-appropriated sketching activity as courses progressed. The requests from fluent students for additional life drawing activities were telling of their desire to improve skill levels.

Lack of retention of taught skills suggested that maintenance activities could be of benefit. Although there was evidence that this was already happening, according to the data from the educators group, the inability of inhibited subjects to recall skills and use them appropriately was an issue. Subjects also requested specific tuition around discipline specifically observation and technique with materials, suggesting that acquisition and maintenance of skills was of interest to both inhibited and fluent groups.

There appeared to be a lack of understanding of the processes of design among inhibited subjects and this was of particular interest to the study. This could be related in part, to a lack of formal art and design education prior to HE. Both groups exhibited little regarding the specific activities and micro-activities of ideation, and there was no

evidence of any theoretical underpinning to their practice. The inhibited subject who referred to the sketch as a non-traditional tool, (digital tools, in her mind, being the established means of ideation), had little awareness of what design actually was.

The data endorsed the use of sketches as tools for communication, although inhibited subjects tended to rely more heavily upon verbal information to support or replace sketches during teaching scenarios, fluent subjects more inclined to utilise them effectively. The use of mental imagery was referred to by many subjects, both inhibited and fluent and subjects relied on this faculty to a large extent during ideation. The issue appeared to be in their ability to represent mental imagery, inhibited students having greatest difficulty replicating this.

The inspirational teacher was clearly a source of support and had encouraged several subjects towards creative careers. Similarly, a discouraging teacher or negative comments from an individual in authority could have a severely limiting effect. Parental pressure was also evident, the values of the former projected onto their children and having tangible effects. Additionally, some subjects referred to childhood sketching activities within the safety of their home environment, suggesting that setting may be significant to sketch activity and thereby, inhibition.

The social element of studio work appeared to be important in supporting students during sketching activity, comparison with peers offering opportunities for development, despite the fear that negative comments would be forthcoming. Good sketching ability was also viewed as a positive factor in peer groups, social advancement possible as a result. Inhibited students were more inclined towards perfectionism in their output, fear of criticism and self-criticism driving this type of behaviour.

Choice of materials appeared to affect and be affected by the individual's relationship with sketching. Inhibited subjects were more inclined towards a limited set of materials, novel materials being used more widely among fluent subjects. Appropriate

materials choice i.e.; large and transparent papers, benefit the inhibited student. Additionally, 3-D model-making appeared significant to the interior design students, suggesting its importance for this and other 3-dimensional-based disciplines.

The inhibited subjects described a heavy reliance upon digital tools during their ideation process. This appeared to stem from the belief that such tools had the ability to ideate, offered a greater sense of progress and were faster to use (despite evidence to the contrary from the industry interviews). An erroneous belief that digital tools provided functions that were not offered by the sketch was of interest: functions including adding layers, showing 3-D imagery, removal of previous moves, and line quality were discussed – the effective use of sketching (according to the literature), able to provide all of these. The digital aesthetic was rated more highly manual output, offering subjects the sense of achievement that their sketching failed to do.

Issues of maturity, self-awareness and intellect were apparent among the subjects and the data offered two specific anomalies of interest: S7 & S11. S7 was identified by her course leader as very inhibited - the interview revealing that she was clearly unaware of this inhibition. She did not suffer the same anxieties of any of the other subjects and maintained she had a very good relationship with sketching. She actively avoided using sketching, and evidenced a poor level of understanding of design process.

In contrast, fluent S11 was very aware and erudite, discussing his ideation processes in great detail. Despite this, he too was susceptible to the anxiety suffered by other inhibited and fluent students of having to sketch in a studio situation. This posed the question: if both inhibited and fluent students suffered anxiety when asked to sketch in the studio situation, what were the coping mechanisms used by fluent subjects, and could these be imparted to inhibited students as part of the management of inhibition?

The incident of subject regarding himself as a consumer of HE - seeing himself as customer and institution as service provider - was interesting. Had this study been conducted ten years ago, it would have been interesting to observe if this issue existed.

Though this data did not demonstrate a relationship between attitude of the individual and sketch inhibition, it did illustrate the changing landscape of perception towards higher education.

The data, once again, demonstrated the importance of three-dimensional models for management of sketch inhibition. These functioned as a support for mental imagery and provided structure from which observational drawings could be made during development. The benefits of such models paralleled those of the two-dimensional sketch, endorsing their importance and adding strength to the suggestion that they should be considered in the same way as the sketch.

Chapter 7: Learning Style Survey & Longitudinal Study

7.1. Learning Style Survey - Introduction

As described in *Chapter 3: The Methodology*, the pilot interviews with design students suggested a link existing between sketch inhibition and learning style. This offered the opportunity to develop the methodology in partial response to Objective 5: *To explore the nature, common causal factors and effects of sketch inhibition among designers*. This is shown below within the methodology model, (figure 27).

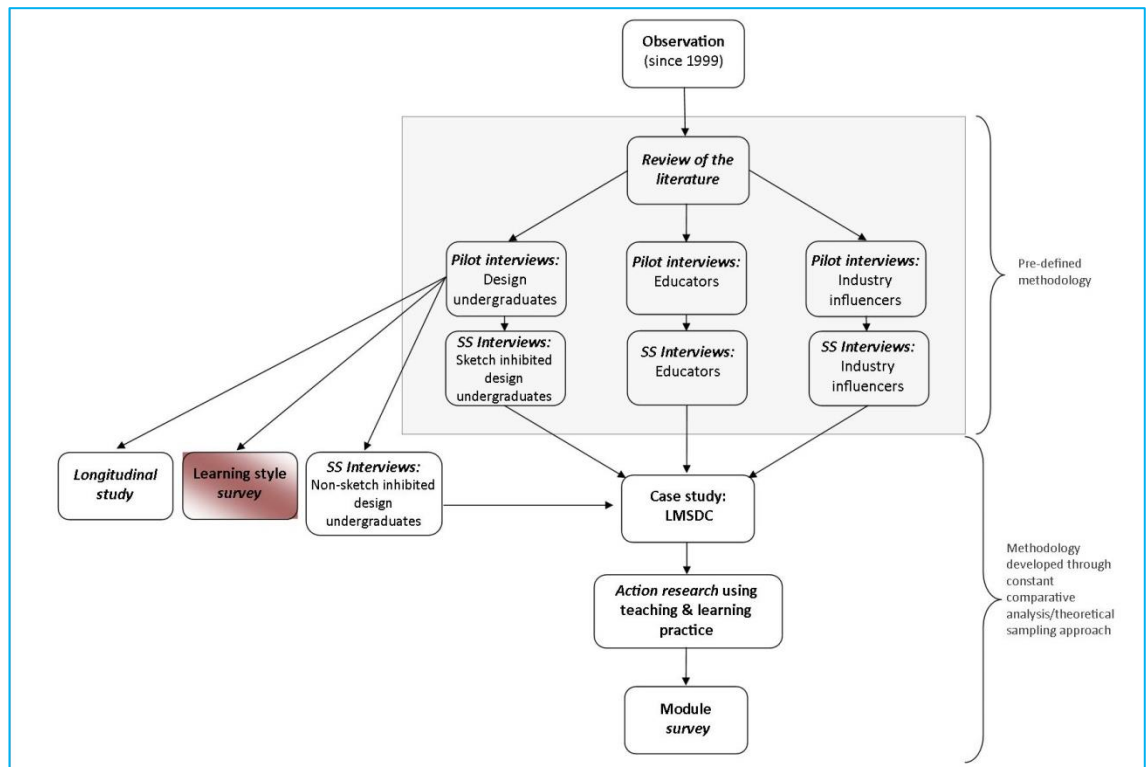


Figure 27: Position of the learning style survey within the Grounded Theory approach. Source: the author.

7.1.1. *Findings from the literature*

Research into learning styles has produced extensive evidence regarding individuals' ability to absorb and process data (Zwanenberg & Wilkinson 2000), such orientation being a crucial determinant in educational attainment (Allinson & Hayes 1988).

According to Cassidy (2004), an individual's particular learning style has fluidity and is responsive to changes in order to facilitate adaptive behaviour, suggesting that clearly defined learning styles may be more difficult to identify than initially thought. However, an overview of them and their measurement was considered of value.

i. Learning style

Demirkan's (2016) study of learning styles among interior architecture students was valuable. By applying Felder Solomon's (2005) inventory, he observed that students had a preference for *visual* learning, recognised such information over text or verbal types, and generated "*cognitive-level representations that support memory, language and thought*" (from Barsalau et al. 2003, p85). He concluded that "*as interior architecture education is mostly based on visual material, it is not surprising that visual learners would gravitate to such a profession,*" (2016, p45). Demirkan (2016) cited Durling et al.'s (1996) observation that students of design also prefer a *global* teaching style. However, he also noted that "*in the design studio all learning styles can be effective at different stages of the design process from conceptual to final design,*" (2016, p48). Demirkan (2016) suggested learning preference could affect the length of design process, citing Felder & Silverman (1988): "*sensors are careful but may be slow; intuitors are quick but may be careless,*" (p676), and "*global learners are interested in the final solution, but not in the details,*" (Demirkan 2016, p35).

Of Kolb's (2005) learning style inventory, Demirkan (2016) noted that students tended to be near the *active/experimentation*, (doing) end of the process continuum. Such activities typically involving drawing, 3D modelling, discussion and testing, (Demirbas & Demirkan 2003) and that the most common style of learning among architects was that of *accommodating* (Demirbas & Demirkan 2007). According to Kayes (2005), Kolb's

learning style inventory is one of the most popular methods for measuring individual learning preferences, however, a lack of accord about the learning style of designers using the tool appeared to exist. Demirkan (2016) noted that second-year architecture students appeared to be more active and reflective than their first-year counterparts, suggesting an increase in active learning as they progressed in their studies. Tucker (2007) suggested that learning style shifted towards one of abstract conceptualisation as students approached the end of their courses - and thus, there appeared to be no clear style among effective design students, making it difficult to establish whether there indeed existed a definitive learning style for designers.

ii. Learning style metrics

The Felder Solomon Index of Learning Styles (ILS), (Solomon & Felder 2005), was developed initially for use with engineering students. Comprising four bipolar scales, it considers preference in perceiving information, information input channel, working preference, and progression of understanding, (Demirkan 2016). A set of questions is applied, the resulting data arranged using a Lickert scale to record preference of the individual, this indicating learning type.

The Honey Mumford Learning Style Questionnaire (Honey & Mumford 1989), originally designed for use among management trainees was considered. Grounded in Kolb's model, there are four learning styles as identified by Allinson & Hayes (1988): *activists* who learn through new experiences, *reflectors* who observe and analyse data from various sources, *theorists* who rely on logic to create conceptual frameworks and *pragmatists* who apply ideas in practice as a basis for problem-solving. According to Zwanenberg & Wilkinson (2000), individuals tend towards one of these styles when engaged in learning or other tasks.

Fleming's (1995) VARK model was developed from the much earlier VARK model (visual, aural, kinaesthetic) and was intended to identify "*preferences of students for particular modes of information presentation,*" (p1). Individuals answer a set of questions that evidence strengths and voids in their learning preferences.

The issue of validity and reliability of learning style questionnaires was widespread in the literature. Allinson & Hayes (1988) review of Kolb's inventory suggested it *"may be of doubtful utility... there is a need for a more reliable and valid measure of learning styles,"* (p271). Additionally, *"certain words within each set are open to different interpretations,"* (Juch 1980 from Allinson & Hayes, 1988, p271) and there was *"difficulty in understanding a number of the terms used,"* (Wilson, 1986 from Allinson & Hayes, 1988, p271).

The Honey Mumford LSQ received a more positive review. Zwanenberg & Wilkinson (2000) believed the Honey Mumford LSQ was *"a more robust instrument with high internal reliability,"* than Kolb's LSI. However Duff & Duffy (2002) *"found the LSQ to have only modest levels of internal consistency... is not an acceptable alternative to the LSI and that its use in the field of higher education is premature,"* (from Cassidy 2004, p432).

Allinson & Hayes (1988) concluded with a warning: *"until the validity of the LSQ has been satisfactorily established, practitioners should remain alert to the possible dangers of putting too much faith in its results,"* (p280). The VARK questionnaire too, was criticised by Sharp et al. (2008) for its ability to trivialise learning.

The incongruity of opinion relating to learning style questionnaires made the choice as to which to use almost arbitrary. However, based upon Demirkan's (2016) statement relating visual learners with the design professions and the clarity of definition of visual learners in both Felder Solomon ILS and VARK questionnaire (presented in Appendix 9), it was decided that both these tools would be implemented among the student subjects.

7.1.2. *Findings*

The interpreted data are presented in tabular form in Appendix 10 and visualised using radar diagrams. Six subjects formed the sketch fluent set, and nine, the inhibited. The VARK questionnaire results for the fluent set are presented in figure 28, below.

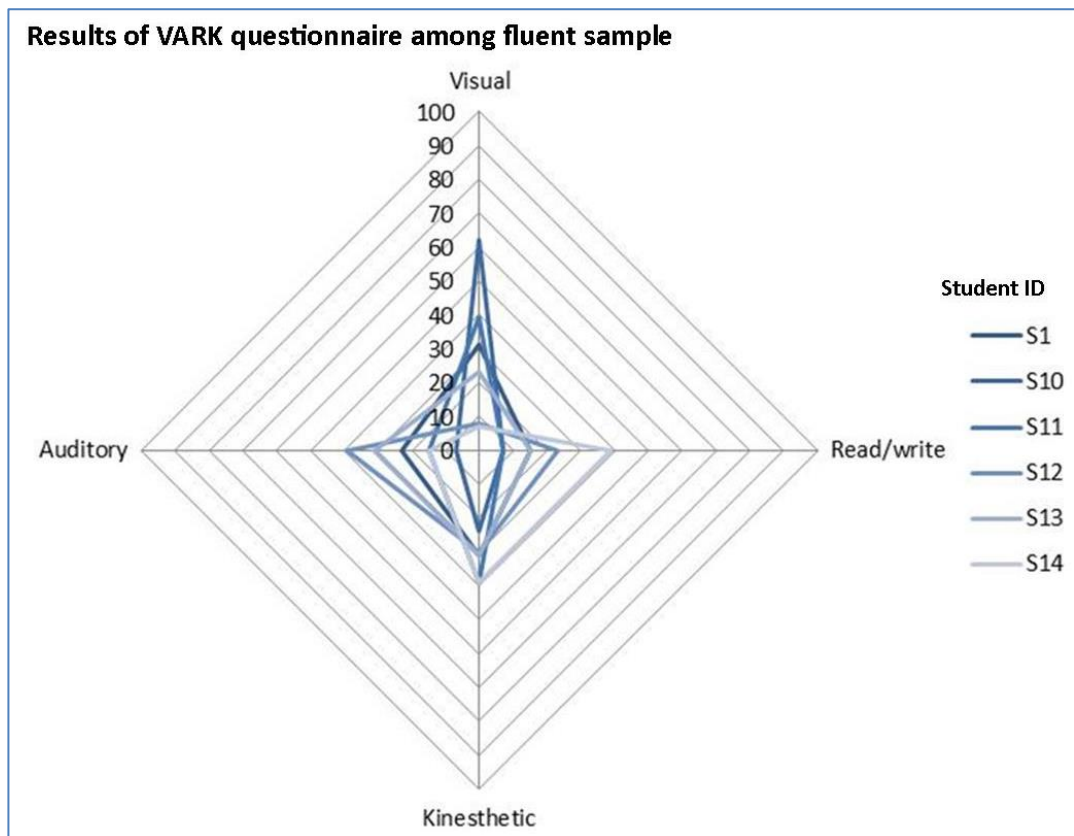


Figure 28: Results of the VARK questionnaire among the sketch fluent set. Source: the author.

A spike is evident in the data along the visual axis, demonstrating a potential preference among some respondents for this type of learning. The responses regarding the auditory, kinaesthetic and read/write preferences appear to be more evenly distributed. A comparison between this and figure 29, showing the VARK results from the sketch inhibited set demonstrates a slight difference in preference between the two types of subject.

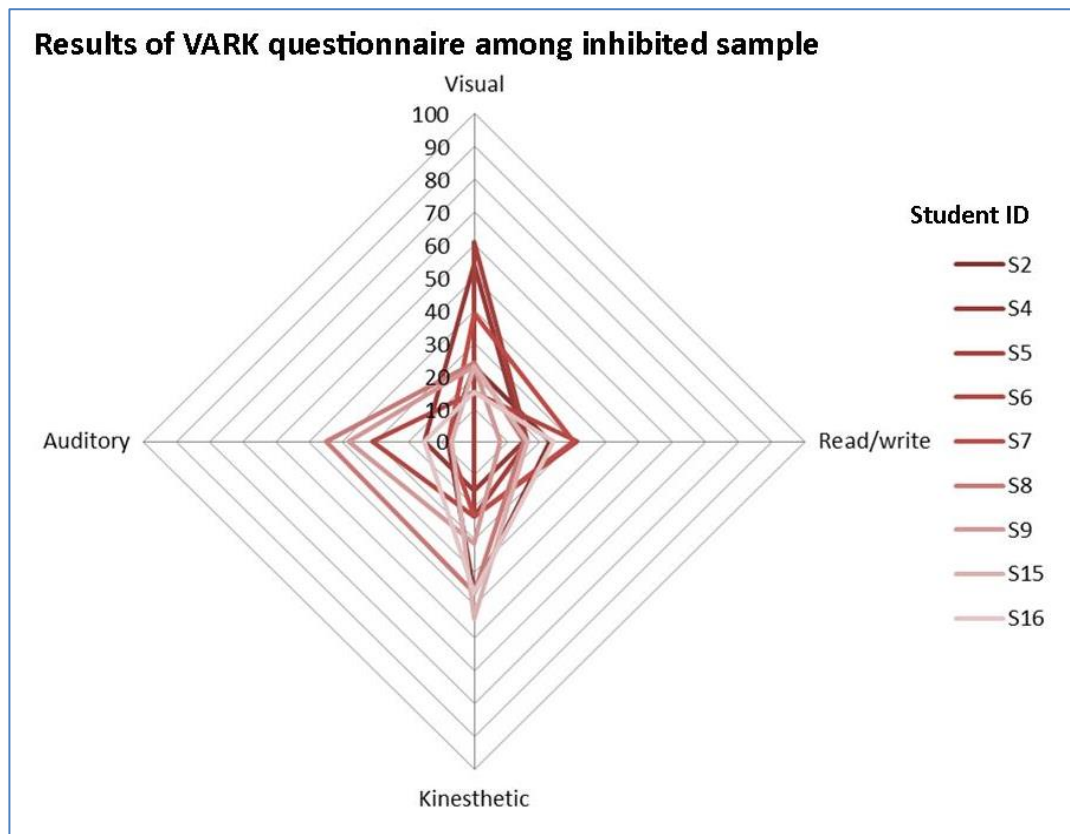


Figure 29: Results of the VARK questionnaire among the sketch inhibited sample. Source: the author.

Among the sketch inhibited set exist a preference for visual learning as per the fluent set, but the distribution of data suggests less preference for read/write styles of learning, and greater preference for kinaesthetic and auditory learning.

The Felder Solomon ILS demonstrated among the sketch fluent set, (figure 30 below) a tendency to prefer global over sequential learning, and visual over verbal learning. An active as opposed to reflective approach was also preferred.

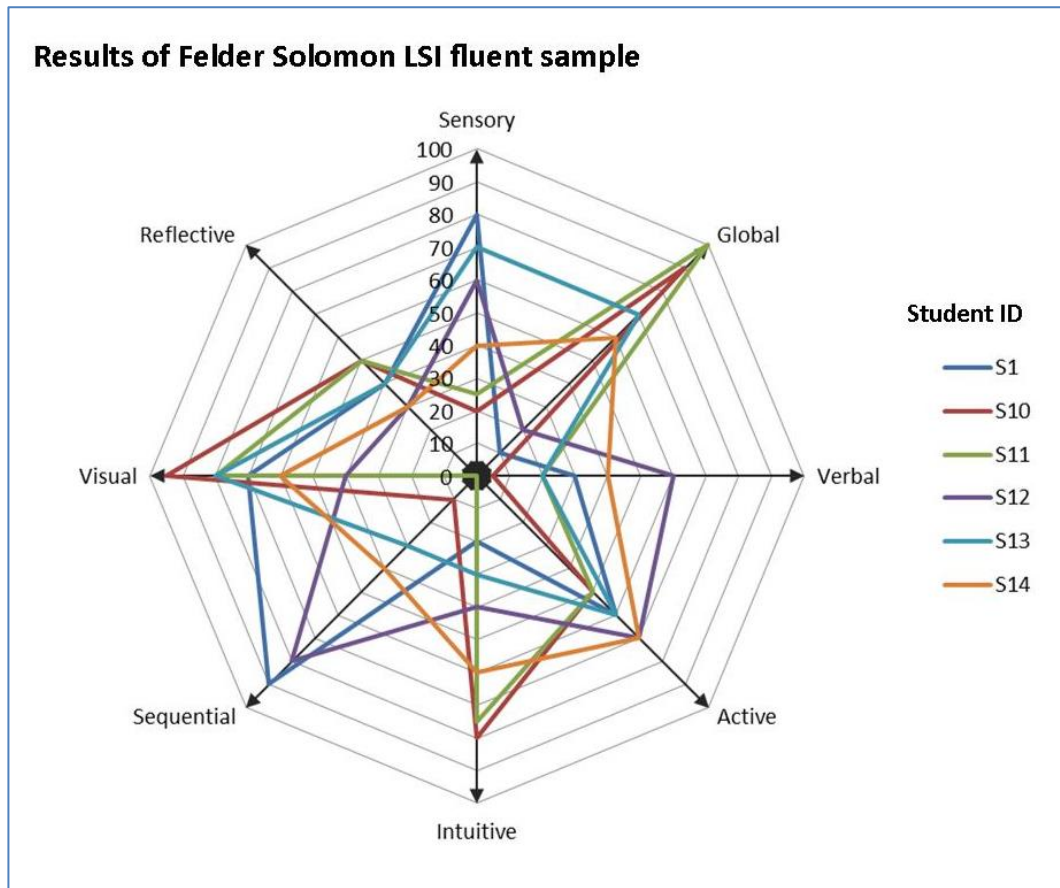


Figure 30: Results of the Felder Solomon Learning Style Inventory among the fluent set. *Source:* the author.

The inhibited set was more evenly distributed across learning preferences (figure 31 below). As per the fluent set, the data presented a strong preference for visual as opposed to verbal learning, as is common among designers and a preference for reflective as opposed to active learning was evident. Additionally, there was greater preference for sequential as opposed to global learning, this possibly evidencing the inability to cope with the large quantity of data within the working memory that fluent sketch users are more proficient with.

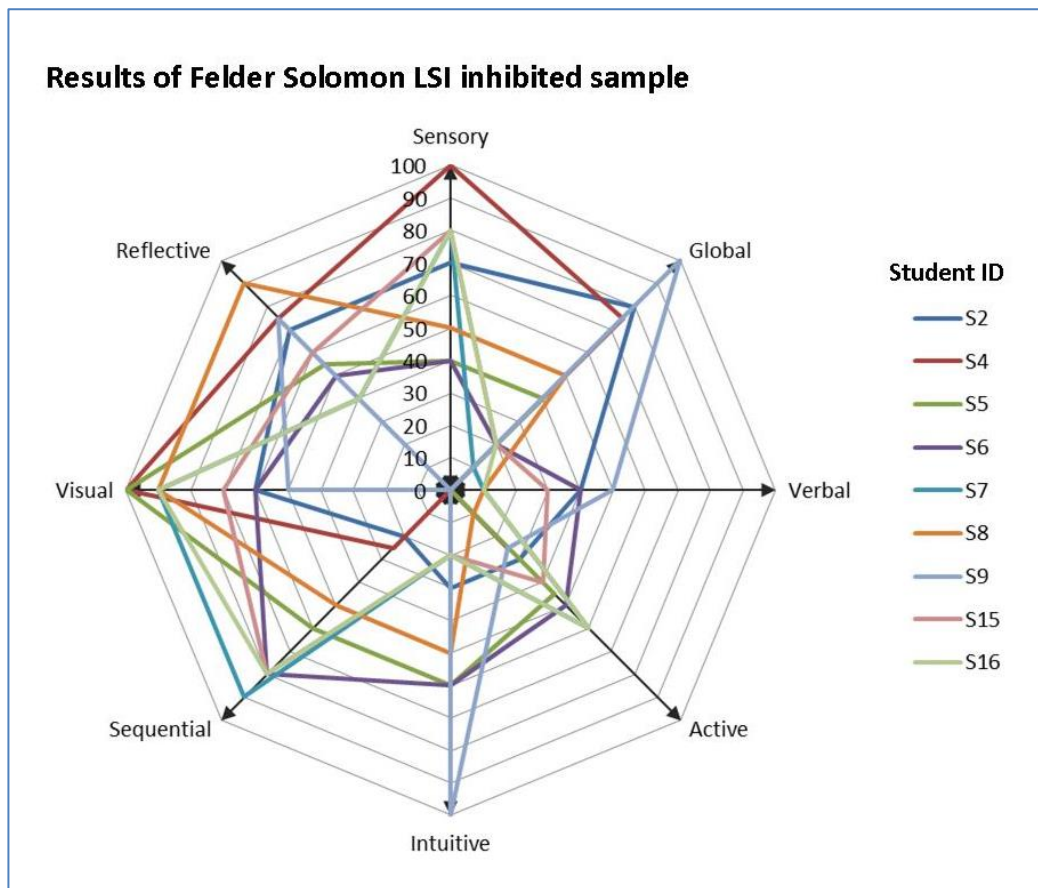


Figure 31: Results of the Felder Solomon Learning Style Inventory among the sketch inhibited sample.
Source: the author.

7.1.3. Conclusions

In response to Objective 5: *To explore the nature, common causal factors and effects of sketch inhibition among designers*, learning preferences and their relationship to sketch inhibition failed to be identified conclusively by either the VARK or Felder Solomon tools. Although the evidence regarding preferences was of interest, some of this did not, (as per the reflective/active axis) support the evidence already established regarding the behaviours of inhibited individuals.

Even among the sketch inhibited subjects, a preference for visual learning styles was apparent. This may suggest that even though such individuals have difficulty in

externalising thoughts during ideation, they possess no lesser faculty with regard to mental imagery than their sketch fluent counterparts.

Reflection, as supported by the sketch did not appear to be demonstrated in the findings, and the higher levels of reflection among inhibited types were somewhat perplexing. However, there may be a simple explanation. It is possible that the preference of inhibited types for reflection over activity may in fact relate to their *inability* to express using the sketch. In such instances, the working memory relied on to a greater extent than the fluent types who are more able to offload with sketching.

The small sample size for this survey cannot be ignored, and results can only be used as an indication of learning preference among fluent and inhibited students: a much larger sample could provide a more exhaustive and accurate data set. The discordance surrounding the use of learning style questionnaires and their reliability was also problematic – if little agreement exists between educators as to the most accurate method of establishing learning preference, then confidence in results will never be high. Although a useful but potentially inaccurate exercise, this survey has evidenced some food for thought and need for further research.

7.2. Longitudinal Study – Introduction

As the interviews progressed, a potential relationship between sketch inhibition and employability became apparent. This was identified as an area worthy of investigation and would possibly offer answers to Objective 1: *To explore and evaluate the specific nature, scope, functions and benefits of sketching activity, the purpose it fulfils within the design process and whether it is a necessary part of contemporary design practice,*” and Objective 4: *“To establish the nature of sketch inhibition as a phenomenon and whether this is problematic to the design process.”* The position of this within the methodology is shown below, (figure 32).

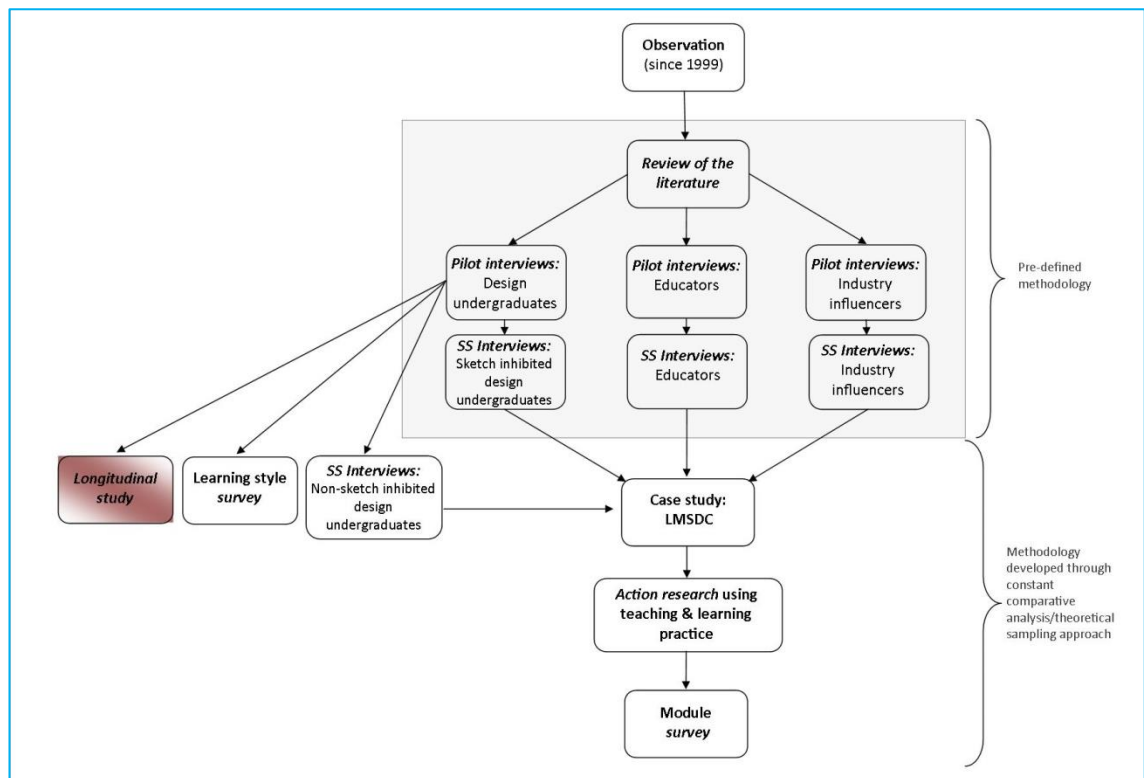


Figure 32: Position of the longitudinal study within the Grounded Theory approach. Source: the author.

7.2.1. The literature

Definitive methodologies for longitudinal studies were almost non-existent in the literature. Luders (2004) noted such studies as subject to little methodological debate, “there are no answers to the simple question of how such studies should be structured,” (p360), but describes them as having great practical benefit to qualitative research. Examples include studies that have spanned over thirty years, (Strauss & Breier 1987), but there is no evidence to suggest a typical or optimum timeframe: this would appear to relate solely to the type of study being undertaken. Such studies include a variety of methods, again, dependent upon the type and nature of data required.

7.2.2. Findings

The data was very thin - so thin there was no call for a separate appendix to contain it. Of the sixteen subjects who agreed to take part, none of the sketch fluent subjects and only five inhibited subjects responded. Their responses were thus:

Two respondents had not found work within the design industries, two had found work within the design industries and one had continued with postgraduate study. Of the two employed within the design industries, one was employed by the design department of Jaguar Land Rover, the other was employed in the print production department of a graphics company.

7.2.3. *Conclusions*

It was virtually impossible to draw any conclusions from this part of the study, apart from observing the lack of success of the method. Although compliance among students during the study was problematic, it was interesting that none of the sketch fluent subjects responded, (and not something that can be explained). Whether the effects of sketch inhibition were responsible for the two respondents who had not found employment was unclear, and whether it was currently affecting those who had found employment was impossible to establish. A complete re-evaluation of the method would be necessary to develop study could effectively establish answers to the issue of sketch inhibition affecting graduate employment.

Chapter 8: Case Study: Leicester Media School Drawing Centre

8.1. Introduction

This case study, as already described in the methodology, was developed as a result of the interviews with educators. The position of this part of the study is shown in the model below. The raw data is contained in Appendix 6, entitled 'Interview with Chris Wright.'

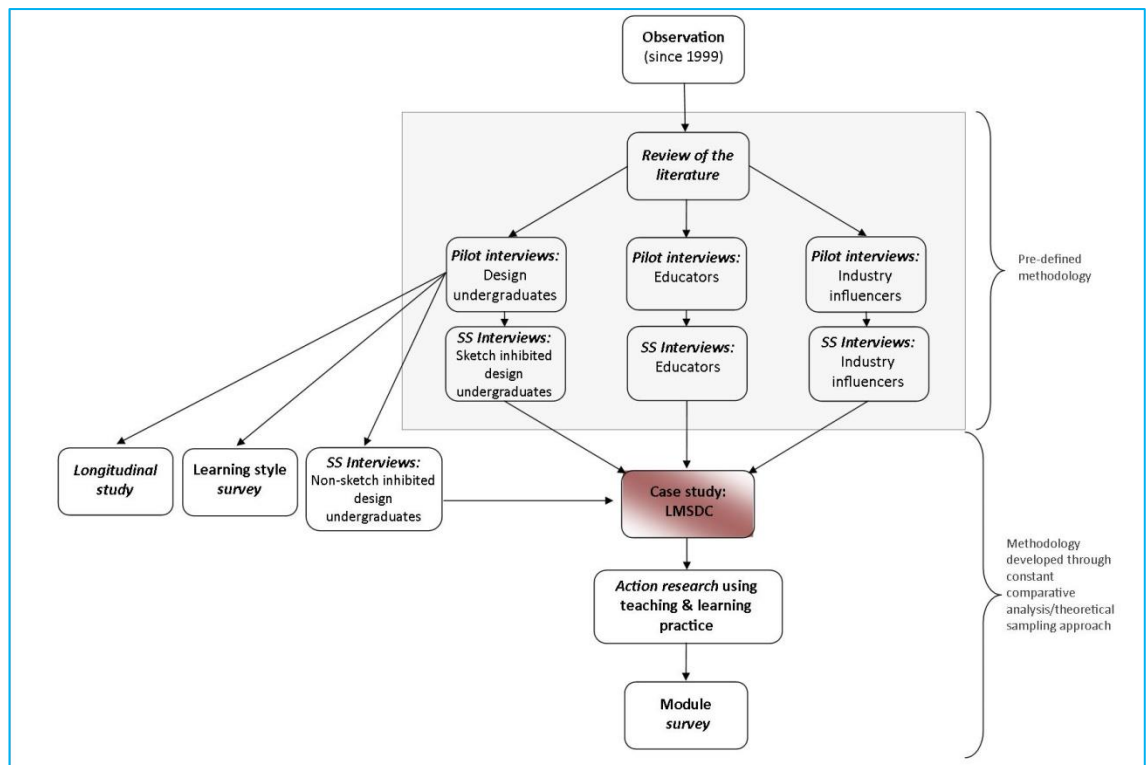


Figure 33: Position of the case study within the Grounded Theory approach. Source: the author.

8.2. The structure of LMSDC

The centre was set up as a result of Wright identifying a shortfall in drawing tuition and support across the courses he taught at De Montfort University. The aim was to

create an environment where students could improve drawing skills through individual and group tuition, non-assessed tasks, personalised feedback and pastoral support: this in addition to students' individual courses of study. The centre, although intended for art and design students, has been accessed for over 650 individual teaching sessions to date, students coming from design and non-design courses. Wright teaches and supervises all sessions personally.

8.3. Findings from the interview: the issues

8.3.1. *Inhibition*

Wright (2018) described his observations of sketch inhibition among students, which echoed those from the other subjects: *"I see nervousness... I see them compare (drawings) to one another, I see them to look at other people on social media and begin to compare and contrast."* Excuses for inhibition were typical of inhibited types: *"I can't draw, my brain isn't wired that way. I've never been good at art. Why do we need to do this? What's the point?"* He described social anxiety: *"they're scared they're going to get told off or scared that they are going to make a mistake."* At this point, he added confidently: *"it's not that difficult to get them out of that mind-set."*

8.3.2. *The demographic*

Wright described three types of individual who sought his help: those eager to improve, those referred by lecturers, and those who wanted to have a go for the enjoyment of it. The group he taught regularly numbered around 140, comprised of almost entirely Leicester Media School students from courses including game art, animation, illustration, graphic design, graphic design in media, communication arts, international film and visual effects.

8.3.3. *Student maturity*

Wright observed: *"that's changed over the years and... I've found that it is possibly less than we've had before."* He referred to providing a level of pastoral support beyond that of drawing tutor: *"it's more about skill level and mechanisms to cope with situations, so it's*

about giving them the right tools to make the right decisions.” He described this lack of maturity as a consequence of prior experience: “students... aren’t as articulate in visual acuity and maturity because they haven’t had that room to grow yet, and I don’t think it’s their fault.” He also referred to an attitude of entitlement that often accompanied immaturity: “a culture of ‘I’m paying nine grand a year; give me my degree, and I’m paying your wages,’ and that I don’t like.”

8.3.4. Pre-university education

Wright described what he believed was an outdated education model. Within this, he felt drawing education was being lost: *“they have fourteen years’ of experience around something to do with art, but not necessarily around drawing or creativity.”* As a consequence, he believed, *“the drawing side of stuff is something that feels alien to the students because it’s not being taught in school; arts are being marginalised in mainstream education.”* He was critical of the current National Curriculum: *“Art is being marginalised to the point that... if you look at the pecking order we’ve got English, maths, sciences, humanities, geography, and you get all the way down to the bottom and you end up with art, and even below that, dance.”* He referred to an unhealthy tick-box approach to education, of marking outcome as opposed to process: *“(by) the time students get here, they’ve got that, ‘teacher is telling me that I’ve got to do this but not giving me a reason why,’”* mentality.

He compared the UK model to that of Sweden, this being particularly beneficial to creativity, *“it’s great for students to learn in different ways... you play in a sandpit, you play with water from the age of three until ten; you’re understanding physics, you’re understanding gravity, you’re understanding how things work.”* The heavily STEM-based UK model, he believed, was failing students: *“we try and force students through a certain system... they teach you that way until you get to university then they tell you, ‘right now draw, now be creative,’* students responding with, *“What is creativity? Why are we doing this? What’s it about?”*

Of foundation courses, Wright was supportive, lamenting their decline: *“we had to do a foundation course before we did a degree - that’s gone now... I’m not saying a foundation course is the be all and end all; it needs to be a good foundation course to develop those skills.”*

8.3.5. *Teaching & learning within higher education*

On the nature of drawing and its teaching, Wright described a level of complexity: *“you’re asking them to do a multitude of different things at the same time, it’s like learning to drive... and it’s not as simple as just drawing a straight line or reading a book.”* He had observed drawing tutors attempting to teach students, themselves lacking necessary skills through no fault of their own: *“it’s not being taught in art schools, and I wasn’t taught it.”*

He noted the difference between the English and Scottish degree models, believing that English students were at a disadvantage, unable to develop the same standard of skills: *“Scotland has a four-year art degree... in the UK it’s like, ‘okay, we’ve just missed a year.’”* He was also critical of the modular system, focussing on assessments that failed to embed skills in practice: *“teaching drawing for... the first term and then saying the students can crack on that with that for the next three years... but students don’t see that as being part of the process, they see it as being, ‘I’ve got to do that for that module’ and pass that module to get to this next bit.”* Retention and lack of consolidation was cited, often the case that *“Students will say that they’ve been taught this in the first year, but they can’t remember how to do it.”*

Lack of cohesiveness in approach to drawing across his institution was expressed. He described the bulk of his students coming from the Media School in the Faculty of Technology, whereas *“in ADH (Art, Design & Humanities) people are trying to push students to do sketches. Students tend to be very scared... very reluctant to put pen to paper and feel as though the digital way is the way forwards.”* He referred to specific courses in ADH that had approached him: *“other courses that have spoken to me recently that feel in ADH there needs to be more sketching... more ideation, more development, more thought processes.”* This lack of cohesiveness within a single institution was perplexing.

Wright considered the hierarchical nature of the relationship between tutor and student, suggesting it had a detrimental effect, *“they see us as being the enemy, or us judging them and they take it quite personally.”* In his experience, a horizontal studio with constructive criticism and feedback eliminated the negative effects of a hierarchical relationship on the teaching and learning process.

On traditional HE assessment methods, Wright noted a legacy of unhealthy fixation on grades: *“we should do less assessment, less marking, more feedback.”* He described his frustration at an over-complicated marking system within HE that he felt was inappropriate for his subject: *“it’s a minefield, when you go into assessments, how do you mark a drawing? Why does a drawing get 67.3%? ... Drawing - it’s a pass or fail; can you do it? Yes or no? Simple. But criteria need to be met... we need to have assessment boards and we need to give grades.”*

8.4. The teaching & learning model at LMSDC – a possible solution to sketch inhibition

Wright’s approach to teaching relied on motivation of the individual student: *“They’ve got to be committed... my biggest thing is making students be accountable... and allowing them to take ownership of their education.”* This was fundamental to success. He said the centre was about *“enhancing what already exists,”* as opposed to creating a separate entity at odds with existing methods.

He believed his model of drawing education was *“about empowering and encouraging students to feel as though they are not making mistakes - or that they’re happy to make mistakes. It’s about progression; make a mistake, play with it, see what happens, move forwards, have another go.”* Problem-centric, holistic tuition was key aspect to approach: *“it wouldn’t be week by week... it’s, ‘right, you’ve got this problem, we need to solve it... through drawing, drawing with light, through communication, through photography, through whatever method we can find.’”*

He referred to there being no assessment within his model. This structure, he believed, empowered the individual: *"it makes the student able to self-assess ... people begin to evaluate what they're doing, but without the pressure of it being assessed."*

8.4.1. *Teaching & learning methods*

Wright's methods were of interest to the research. His first comment regarded the concerns of students: *"I don't listen to the reasons of why not, it's, 'let's look at why, let's look at how, let's have a go.'" He also refused to buy into anxious protestations: "I just turn round and 'go crack on with it, if you make a mistake, it's good, there's going to be a positive within that."*

The centre's initial fixed curriculum posed a problem - enabling students to avoid those classes they felt uncomfortable doing: *"Having a set curriculum wasn't necessarily the right thing to have, because they were picking and choosing."* He believed that several elements were necessary to a successful session: *"if you combine those, then that becomes ebb and flow."* He described a typical session: *"My teaching has always been about demonstrations, encouragement... We'd have lecture, recorded footage, tutorials, helping, feedback... I never run at the fastest pace but I never run at the slowest pace in either."*

Wright encouraged the use of opposite hands as a means of confusing the rational mind. This appeared to reduce inhibition: *"I got them to copy something... to work with left hand and then right hand and then blind contour, and completely confuse them... and they began to draw without thinking about it."* Blind contour, timed, was also favoured for disabling rationalisation: *"we're not going to look at the paper - and you've got thirty seconds. Then you go 'right change hands!' so you don't give them time to think."*

He observed these exercises benefitting inhibited and fluent students in the same way: *"Even if you can draw, I've changed your hand and you can't do it, but what we're analysing there is fluidity in the marks that have been produced."* He referred to a sensory attitude toward mark-making, following his ethos of *ebb and flow* and using the entire body: *"When you want to get darker, feel your way round ... when it's dark and you want to..."*

render dark, use your arm and push, and when it's light, pull, and all of a sudden it becomes a whole-body experience."

Site-specific tuition was considered vital to certain types of drawing, especially perspective, traditionally taught in a classroom environment. Combining this with other anxiety-reducing tools was effective: *"I showed them what perspective was... and placed them in an environment. I... said 'now draw it with the wrong hand in thirty seconds without looking at the paper.' 99% drew perspective, because they didn't think about it, they hadn't got the, 'no that's wrong' in their head."*

Mistake-making and experimentation was an accepted part of sessions, judgement and censure between students unacceptable: *"no one takes the piss out of each other in here, no one is better than anyone else."* It was understood that everyone in the session would produce valuable images, their output not being judged aesthetically as if an artefact of fine art. Wright endorsed this as a vital process for all students, whatever their ability or level of inhibition: *"I go round the room and praise everybody, 'look at this, look at the fluidity, look at the arabesques...you're applying and you haven't even realised.'"*

A single session often contained a wide variety of activities. These typically included, *"blind contour, a quick lecture, get them to draw each other, get them out looking at perspective... combinations of different practices, encouragement, workshops that are fun, taking them out of their comfort zones slightly but allowing them to revert back to it."*

Unlike most other drawing curricula, which focussed purely on observation and artefact-centric mark-making, Wright's advocated an appreciation of theory. He believed this created mindfulness essential to drawing and assessing output. His lecture, approximately forty minutes in length, but fast-paced, conveyed a huge amount of pictorial and theoretical information about drawing and visual analysis. This speed of presentation created a sense of urgency and an excitement about revisiting the material afterwards – a level of engagement that educators often struggle to achieve. The content of the theory lecture included terminology unfamiliar to many

students: gazing direction, breathing room, arabesques, flow lines and focal points. Wright referred to sacred geometry, the Golden Section, Fibonacci series and evidenced these using copious visual examples.

8.4.2. *Materials*

Wright felt that informality of the studio was important to inhibited students: *“if you sit them in front of a donkey or an easel... they are even more petrified.”* His solution was to give each student an individual still life to work with.

He observed pressure to use traditional materials but was open to any medium that served the purpose: *“students should be encouraged to be creative around the processes of design and I think could be done by a multitude of different things, I think drawing is one vessel, photography is another.”* This approach was illustrated using sessions run for MA film students, many of whom had never drawn: *“they are using storyboarding to learn to draw, they’re learning focal points, spatial understanding, measurements.”* He added, *“we don’t need to use pencils, we’ll use a camera.”*

Non-precious materials were endorsed for encouraging an uninhibited approach: *“If the materials are cheap and throw-away then students go, ‘yeah, let’s have a go, let’s make a mistake, let’s not worry about it.’”* Similarly, large sugar paper was preferred for *“teaching people to draw with movement.”* However, Wright believed that loose sheets were sometimes problematic: *“if we teach them on paper it gets left behind, it gets put under the bed.”*

The issue of scale was discussed, *“...but if they feel as though they’re not doing very well on that scale I’d quite like them to change...but I’d like them to document it.”* Wright believed that inhibited students often found large substrate sizes daunting - he preferred students to work in a sketchbook or journal to begin with: *“it doesn’t have to be expensive...just working documents, it encourages them to be creative, it tells them that’s not precious, if you make a mistake that doesn’t matter.”* He demonstrated a sketchbook at this

point: a cheap exercise book, far removed from the expensive sketchbooks undergraduates took to using: *"I show students that my sketchbooks aren't precious in any way whatsoever."* He endorsed their use for several reasons, *"it's about getting people to evidence and reflect on what they've been doing... through criticality, through creative thinking."* Additionally, *"documenting the learning processes"* was cited: *"it's about being self-reflective on the stuff you've been doing."* The materials he recommended were, *"a graphite stick or a pencil and a small sketchbook just to get people started."*

Wright was happy to endorse digital tools as a supplement to traditional skills. He recounted situations where digital tools could mask a lack of ability: *"you need a grounding in good visual communication skills, you can't just jump in and go from, 'right I want to be a concept artist, let's start digital painting,' because that doesn't work."* He also reiterated the sensory, bodily process of creating imagery using sketching, noting, *"that you can't do on a computer."* He warned of reliance on digital tools combined with a lack of life-based references, students again believing that, *"you don't need drawing, you just need a computer (to) digipaint, and work from photographs."* In these instances, *"all you're doing is copying from a photograph, and you're not understanding the lighting conditions... value range, perspective."*

He did however, endorse the iterative benefits of some digital tools: *"for ease of development, a tablet is great because you've got control, you can go backwards step... you can redo."* Sketch technology, Cintiq for example was also favoured for its likeness to traditional methods: *"you can take an image on one screen... you can draw over the top, you can trace, you can copy, you can push things around... You can suddenly change that image or... free transform ... so actually through an iterative design process, the screen is probably better."* He added a caveat: *"...but you need the background and the understanding of the fundamentals before you can get to that."*

8.4.3. Feedback from students taught at LMSDC

This was obtained from two sets of students: 1. those attending informally for tuition, and 2. Contour Fashion undergraduates as part of pre-arranged sessions.

The students attending informally offered the following feedback from their experiences. All feedback was supplied anonymously. On their depth and breadth of learning, Wright noted: *"With the game art students, a lot of the stuff I've had back is like, I've learned more in twelve weeks than I have in fourteen years."*

The informality of sessions together with lack of assessment was also popular. Wright described student responses: *"We like this teaching method because it was laid-back and it wasn't being marked, we felt very comfortable, Chris made things easy, there wasn't a barrier between us, there was no hierarchy."* Contextualisation of taught material was also cited as beneficial: *"Chris explained something to us and then tells us why, and explained how it fits into the overall side of things which people haven't done before."*

The Contour Fashion group attended sessions at LMSDC arranged by their course leader. Wright's programme of activities and theory was imparted, the intention being that acquired skills would later be applied in students' own projects. Several students expressed an increase in confidence after the sessions: *"Gave me confidence with layout of my drawings and to be able to have confidence drawing without looking at the page,"* and, *"I feel much more confident in my ways of how to draw."* Surprisingly, even the timed exercise was appreciated: *"I enjoyed the timed drawing as it encouraged me to draw with more fluid lines."*

The taught and theory-based elements of the sessions were commented upon, with particular reference to the quantity of material covered: *"Great information - I have learned a lot of new interesting things,"* *"A lot of info to take in and applied - opened my eyes to possibilities and complexities of a picture."* The applicability of material to the individual's own work was commented upon: *"Gives a really good understanding of placement and composition...will help improve our artwork and portfolio,"* *"Found it very useful. I will be able to apply the techniques learnt to my work,"* and, *"I am already applying what Chris has taught us into my fashion illustration work and board layouts."*

Students appeared to want to continue with their drawing activities, rather than tick them off and move on: *“Learnt a lot more about drawing freely...will be coming back to help improve my work,”* and, *“Helped me improve my visual presentations and drawing skills. I hope to now practice and learn more.”*

The availability of LMSDC to students above and beyond the drawing tuition offered by their own courses was of particular significance to some students, suggesting they perceived a gap in their learning that was at last being addressed: *“Would have liked to have them from the start of the year and throughout,”* and, *“I am so glad the University are finally offering support in this.”*

In conclusion, Wright reflected upon his methods: *“If you don’t want to come to a studio that’s free, that doesn’t do marking, doesn’t do assessments, gives you constant feedback, constant positivity, an area to grow, fun projects, time to think, time to grow. If you as a student turn round go, ‘no I don’t want that,’ I’ve kind of given up.”*

8.5. Conclusions

According to the data, pre-university education appeared predominant in the development of inhibited behaviour. The national curriculum focus on STEM subjects and a loss of time for creative subjects had reduced the status of drawing. Assessment methods based upon outcome (as opposed to process) and fixation on grades appeared to undermine creativity, risk-taking and their associated processes, i.e.; drawing. A lack of formal teaching of drawing within creative subjects was also an issue – already proven by the literature.

Further education and foundation courses may not give students the skills they need to flourish in higher education. A disparity seemed to exist between courses, leaving students open to the vagaries of individual institutional approaches. Tutors with poor drawing ability, themselves unskilled in the very activities they need to be imparting, were also a concern.

Within the HE environment, student maturity was an issue. The tendency to remain in a comfort zone and avoid risk-taking - although a normal reaction to unfamiliar situations - appears to have increased. Learning is often judged by students – and tutors – by assessment marks, the value of the learned skill subordinate to this. The growing customer-centric mentality within HE coupled with reduced student maturity appeared unsupportive of the environment needed to improve sketching skill levels. The need for a longitudinal approach to maintenance of skill was evident – first year undergraduates often taught skills that were forgotten once assessment had finished. Embedding these more effectively would be required.

Within LMSD, the informality and non-hierarchical structure of the tutor-student relationship flourished. The lack of assessment was conducive to the experimental, risk-taking approach being encouraged and students seemed to thrive on the constant feedback they were given. The pastoral support element also appeared vital to underpinning the building of confidence.

The importance of observation was clear – still life and site-specific activities all relied upon learning to see; the mark-making element being a product of the activity and not the end in itself. Site specificity during teaching was important. Taking drawing from the studio and engaging with it in real-life situations, seemed to make it more relevant.

The use of non-precious materials and alternative mark-making, (such as photography), were considered relevant: risk-taking appeared not so risky if cheap materials were used. This non-purist ethos appeared to benefit those with the least drawing ability and experience. Digital tools clearly had their place, although they were not allowed to replace good observation and confident mark-making: reluctant students unable to hide behind such tools and only using them once they had mastered the basics.

Theory was a vital part of teaching and learning. Unlike most drawing lessons, which focussed on the mechanics of the activity, the inclusion of wider theory of image-

making and interpretation immediately placed the activity in context. The ebb and flow approach of teaching sessions created an exciting experience - one of exploration and adventure. It also reduced the effects of the rational, critical mind - experiences being *in the moment* and less susceptible to the anxiety of traditional drawing classes.

The benefits to students were doubtless. Students appeared to enjoy the activities: there was no evidence of reluctance or anxiety, and the unanimously positive feedback suggested increase in confidence and a willingness to use skills in future activities.

Chapter 9: Fulfilling the Objectives

9.1. Introduction

This chapter draws together the findings from the research activities, selectively coded according to Strauss & Corbin's (1994) approach, in order to fulfil the individual objectives of the research. Objective 1-5 are presented below, concluding with *A Grounded Theory of Sketch Inhibition* based upon fulfilment of those objectives, and forming the study's first intended contribution to new knowledge. Objective 6: *To develop a pedagogic framework for design education* is presented subsequently and separately, providing the study's second intended contribution to new knowledge.

Fulfilment of the objectives is presented in as concise a manner as possible, the broader discussion around data having already taken place in previous chapters.

9.2. The objectives

9.2.1. Objective 1

To explore and evaluate the specific nature, scope, functions and benefits of sketching activity, the purpose it fulfils within the design process and whether it is a necessary part of contemporary design practice.

The study has clearly demonstrated the sketch to be intrinsic to design practice. At its most primitive, the sketch exists as a set of marks on a substrate, often made without preparation, utilising a system of symbolic icons. In its purest form, the sketch represents a system of freehand pictorial externalisation - a two-dimensional non-digital entity produced without the use of instruments and can range from informal to prescriptive or concrete. Its effectiveness relies upon a level of expertise on the part of the user, and requires maintenance for fluency. The sketch is also identified as existing beyond this scope, and may include the representation of any concept utilising any

medium, suggesting a nebulous relationship with the materials and the process of their creation.

As a communication tool it comprises the typical elements of language: a set of indexical icons, (the signifier) and their meaning within an assigned system (the signified), but unlike verbal language, it is non-linear and allows for connotation through interpretation, (in addition to denotation). It can be monosemic, poly- or pansemic and can function on multiple levels; representing the designer's idiolect, and the dialects of designer and non-designer.

The sketch fulfils multiple functions during the design process. Cognitively, it can be identified as the point where mental imagery is realised in tangible form. It is intrinsically linked to creativity and is discipline non-specific and enables the representation of design knowledge and external percepts allowing for reflection. It is an effective tool for information management throughout the design process. It can handle and represent complex and tacit information typical of design activity and can demonstrate relationships and connections in multiple directions in a non-linear fashion. It also surpasses verbal information as a tool for communicating such complex and tacit information.

During the early stages of the design process, it supports identification and development of design problems. It supports concept generation and the exploration of thoughts, functioning as a driver of such processes. It also operates as a decision-making tool during the selection and development of conceptual information. It is representational of the processes of design, providing ideation with a rapid and economical method of depiction – one that can be disposable and nonprecious, (requiring no specialist or expensive equipment), and having the capacity to store information for, and generated by, such process. It facilitates offload of the limited working memory utilised during ideation, allowing for further development of concepts using mental imagery, and supporting the maximisation of creative thought.

It offers ambiguity to the user, enabling the representation of incomplete information, allowing for reinterpretation of data and development of unforeseen concepts as a result.

It has an invaluable role in the relationship between individuals within the design process supporting communication, encouraging discourse and acting as a conscription device. Its necessity within contemporary design practice is unquestionable: although other tools can effectively represent design activity, the specific qualities of the sketch and its intrinsic relationship to cognition cannot be replaced by other means.

9.2.2. *Objective 2*

To explore the internal dialogue and processes of the designer during the design ideation process.

The internal dialogue of the designer can be broken into two separate orders, that of process and micro-process, the former considered first. In the simplest terms design process involves the generation, manipulation and apprehension of mental imagery towards a solution requiring an idiolect within which the designer can work.

The idiolect involves a plane of content, (the mind), and plane of expression, (the sketch). The continuum of these two planes enables the functional, creative and perceptual attributes of design information to be considered and advanced. An oscillatory process exists between planes: visual information apprehended and developed further through mental imagery, and mental imagery recorded and reflected upon. In this way imagery can be reflectively criticised and creativity provoked - quantity of sketch output during this process demonstrated to support the development of concepts.

The meanings apportioned to sketch imagery are developed from a combination of designer idiolect, plane of expression, disciplinary language, experience of the individual using that language and the Gestaltising tendency of the mind. Variation of any one of these elements affects output and consideration of that output, potentially impinging upon design development.

Design problem-solving involves processing complex visual and spatial information at different levels of abstraction. External percepts are combined with structures from the slower longer term memory within the much faster short-term working memory and from this, novel concepts emerge. Constructs of mental imagery can be highly complex and unable to be held for long within the working memory; such forms can be apprehended, but the initial impression within mental imagery is that of the macro-construct.

An optimum working memory during design ideation relies on the close relationship between mental imagery and depiction, in order to provide an extension to working memory. Quality of mental imagery can suffer if working memory is not regularly offloaded using a fast and accessible method – this makes the sketch a vital tool. If a fast method is unavailable, cognitive activity can be reduced, thereby affecting efficiency and creativity.

Design information appears to develop in either of two ways; deductive development relies on linear and logical process of problem evaluation. Inductive development relies upon the intuition-based leap. The cognitive micro-activities of the designer during design development are identified. The individual design move, often embodied by physical activity - including sketch output - is composed of multiple individual micro-elements of thought, such moves are compositional of the entire design process. Activity along such a continuum can also be described as a process of movement followed by reflection. The micro-activity of conceptual development utilises both lateral and linear transformations. The former generates quantity of conceptual information, the latter driving development of the individual concept

identified within that body of information. The oscillation between mental imagery and representation during this activity appear intrinsic, cognitive activity and the sketch, again, being functionally interdependent.

9.2.3. *Objective 3*

To establish the current position and status of sketching within contemporary design higher education alongside other concept development tools.

The process of reviewing and coding the data in preparation for writing this passage proved the most depressing part of the study. Only at this point did it become clear how little educators actually understood of the functions and benefits of sketching during ideation, despite espousing its importance. As many of them were or are design practitioners, it also became apparent that they themselves may suffer sketch inhibition in one form or another, this potentially being passed on to their students.

The current position of sketching within higher education appears to be highly variable; it's status having been reduced, generally, to an all-time low over the past few decades. Historically, art and design schools required students to achieve a prescribed level of skill, but the demise of many of these schools including their incorporation into larger new universities, particularly during the 1990s changed the landscape of design higher education dramatically. The concept of learning by rote appears, currently, to be highly unfashionable, and the application and repetition required to develop an effective skill-set does not exist in the way it used to.

Wang's (2010) notion of a lack of intellectual rigour surrounding creative subjects applies to and can be seen clearly within sketching and drawing education. Despite believing these were imperative to the design process, educators bemoaned a lack of skill amongst their students, describing an *ideal* to which they felt their students should aspire. This illustrated acknowledgement of a shortfall within design education but lack of agreement as to how this should be addressed.

A tendency to offer a crash course in sketching skills during the first year of degree courses followed by an assumption that students will a) retain that information, b) be able to apply it effectively to their design work, and c) continue using it in a self-directed manner during project-based work, did not appear to benefit students. The notion of students *picking it up* as they go along is highly erroneous. As a result, they lack mark making ability, fail to understand fundamental skills, and are not confident in their use, thereby avoiding such activity or diverting it into other less successful media.

Lack of drawing ability among tutors was very concerning, and it was clear that their own reduced skill sets impacted the learning experience of students. Most tutors failed to engage in any kind of sketching activity with their students, but those who did, did so with alacrity and passion. Again, this endorsed the huge variability in the quality of teaching.

Theoretical understanding of drawing and sketching is virtually non-existent. Educators appear to have little understanding of the theory, cognitive support or micro-processes of the activity. Although awareness existed that conceptualisation relies upon and is conducted via the medium of manual sketching, and understanding how creativity and reinterpretation instances increase during its use were generally absent. Where this understanding did exist and was being taught, it was to an extremely high standard, again, highlighting the huge disparity between lacking and excellent teaching.

According to both educators and the design professions, sketching and drawing ability among design graduates has notably reduced in recent years. Graduates and interns in commercial organisations struggle without the skills required of them, their prospects of employment duly reduced. This suggests that education is failing students who leave degree courses unable, and without the confidence, to sketch.

The introduction of digital tools to design higher education during the '80s and '90s massively impacted design education and appears to be one of the biggest antagonists to sketching and drawing. The necessity to teach digital tools has reduced curriculum time available to other skills, including drawing and sketching.

Students' erroneous assumptions that CAD can ideate and is the best route to employment are concerning. The reduction in student attendance for sketching and drawing activities suggests that many students are just *not getting it*, and *not interested in getting it*. Despite this, some students are actively seeking additional drawing tuition, suggesting that the dearth of skill and desire for improvement is not entire.

The misapprehension about the nature of drawing for design compared with that for fine art appears to pervade higher education, and the notion of sketching as artefact-centric activity still exists. Even during mark making and ideation sessions, students are more aware of and concerned with the appearance of their output than their cognitive processes.

The drawing ability and learning preferences of Millennial and Generation Y students suggests there is a need for a shift in approach to teaching and learning the skill. Their alacrity with and preference for digital tools, based upon a lifetime of engagement with them, is often at the expense of manual techniques and their reduced skill level upon entering higher education is not being met with teaching that responds to their needs.

Design higher education perpetuates the legacy of assessment-driven primary and secondary education. The promotion of STEM subjects within the curriculum at the expense of creative subjects continually endorses these as second class and consequently favoured by those less academic or capable. Together with further education that fails to impart high quality practical skills in favour of other, more enticing (mostly digital) activities, appears to validate the notion of sketching and drawing being trivial and non-academic. Consequently, this attitude pervades higher

education, providing an arid base from which to build skill set; getting students to even engage being a challenge.

The blurring of lines between design and visualisation is problematic, educators and students appearing equally ignorant of the difference. The use of CAD has affected this, students unaware of their processes and concerned purely with aesthetic of output. A lack of understanding of their cognitive processes makes them unable to identify the difference between the two activities. The introduction of such tools, generally during the first year of study, may suggest to students they can be deferred to should other methods of ideation prove unsuccessful. The growth in use of digital tools within higher education has pre-cursed the acknowledgement that drawing skills among students has weakened, but surprisingly, it's has taken a long time for this realisation to occur.

Recruitment processes appear to be less rigorous than historically. The expansion in course provision and larger student cohorts mean those with weaker skills are accepted onto courses. However, such students do not appear to improve in their ability and struggle throughout their courses. Where drawing tests were included within the recruitment process, these are deemed unfashionable and excluding; the antithesis of the current ethos of inclusivity promoted by contemporary higher education.

The use of use of three-dimensional model making and mockups appears to be a highly effective tool during ideation, and one offering all of the benefits of two-dimensional manual sketching. In addition to this, it has the benefit of providing tangible external percepts observable by the student when representation of mental imagery is problematic via the sketch tool. The purity of three-dimensional models appears unimportant during ideation, the use of found objects providing effective representation to enable the development of concepts. Their use alongside traditional two-dimensional sketches is common within interior and architectural design, but their potential to support ideation across many other disciplines is significant.

9.2.4. *Objective 4*

To establish the extent of sketch inhibition as a phenomenon and whether this is problematic to the design process.

The evidence suggests that sketch inhibition varied between institutions, but that as many as 75-80% of students in large cohort groups were inhibited in some way. Smaller cohort groups appeared to suffer less, 15% being cited as inhibited.

Awareness of the existence of sketch inhibition varied according to those who encountered it. Educators were highly aware and industry influencers bemoaned the consequences of the phenomenon. However, students suffering sketch inhibition were mixed in their levels of awareness, some acutely aware of their shortcomings and able to explain these, others blissfully ignorant.

It is clearly problematic to the design process, sufferers unable to visualise mental imagery, reflect upon output and use this as a driver of the design process, tending to rely on the limited capacity of their working memory. Design output is undeveloped, naive - in some cases there is no design - digital visualisations cited as disguising such creative shortfalls.

The results of sketch inhibition affect the employability of graduates. The inability to ideate, represent conceptual information, forge and maintain relationships with clients, function within single and multi-disciplinary groups, and be an effective team member are common - all of these shortcomings having financial and commercial implications for organisations.

9.2.5. *Objective 5*

To explore the nature, common causal factors and effects of sketch inhibition among designers.

The nature of sketch inhibition as a phenomenon appears complex. This study has identified specific causes and effects, but its indicative nature precludes the deeper investigation of some of these. Suggestions regarding the potential for further research are considered in the following chapter.

At the outset of this study, the assumption was held that digital tools were likely to be the biggest offenders in causing sketch inhibition; however in identifying the complexities of the issue, it became clear that these were part of a wider set of causal factors. A lack of understanding of the benefits of sketching to ideation, and having no theoretical awareness of its functions appears to degrade it within the perception of students.

An increasing lack of engagement with sketching and drawing amongst children, often in favour of digital based activities, appears to reduce the desire to engage with it, affecting fluency later on. Education has a significant part to play in the cause of inhibition. The artefact centric attitude towards arts and design subjects in primary and secondary education - the *don't colour in over the lines* approach of many teachers - enforces at an early age the fear of making mistakes that is an important part of creativity. The government led promotion of STEM-based subjects, particularly within secondary education, together with continual assessment has marginalised creative subjects in general.

The demise of the traditional art school appears to have reduced the numbers of proficient educators and has diverted attention away from the application and repetition of sketching activity, current models of education being less structured. Poor quality further education, attracting less capable individuals into creative subjects they would have previously had no access to, routinely fails to impart effective skills to applicants of higher education. The monetisation of further and higher education has led courses to expand rapidly and cohorts to grow, allowing weaker students to fall through the net, leaving education without skills necessary for their future professions.

A positivist, modular and assessment-centric higher education system has reinforced the notion of skill acquisition as one of tick-box activity. This applies to sketching among other skills, creating the tendency for students to learn facts, apply them for assessments and move on without effectively embedding them within their practice. Assessment also conflicts with development of good sketching skills, creating unnecessary pressure and an artefact-centric mentality towards their production.

The quality and extent of teaching drawing and sketching skills in higher education appears to vary enormously and there is no defined model of best practice in place from which educators can collectively work. The friction between fine art observation drawing and the type of observation used by designers is often misunderstood in the first place. Good drawing and sketching instruction can be a *luck of the draw* situation, often relying upon the few tutors who have been well trained and extol the virtues of the practice.

The lack of delineation between visualisation and ideation appears to confuse educators and students. As a result, students demonstrate little awareness of their processes and can make poor choices about their methods. The ubiquity of digital tools bears huge responsibility in this situation, and has led students to believe that the computer will ideate for them. Such students will often maintain that this is the only way they can design. In many of these instances, quality of output is also poor, individuals assuming their ability with such tools is far greater than it actually is.

Student personality is enmeshed within sketch inhibition. The apparent reduction in student maturity and resilience in past years has impinged upon their willingness to risk-take and accept constructive criticism, as is a part of the higher education experience. Those with more maturity demonstrate greater self-awareness of their shortcomings and the need to apply themselves, often able to overcome weaknesses by themselves. Culture as a factor in sketch inhibition suggests that some have very different perceptions of the definition of sketching, its purpose and benefits and how it should be taught. The notion of sketching within the wider risk-taking activity of

design was problematic to some cultures, whereas others embraced it. Student misperceptions of their own ability, both good and bad, can be seen among sufferers, curiously, those with good ability sometimes perceiving themselves as unable to sketch effectively. Confidence, in this instance appears to be the issue. A perfectionist attitude towards sketching and the overworking of outputs produced during this process is noted. Such individuals can spend more time rendering and shading than in the production of sketches, this in itself a form of distraction from the activity in hand. The replacement of sketching with textual or verbal information is also apparent, concepts communicated via the use of linear information - lists and protracted explanations - rather than through lateral sketch imagery.

Absence from teaching sessions is a major symptom of inhibition, the avoidance of sketch activity guaranteed by not attending classes. This has compounding effect over time, such individuals becoming yet more inhibited. Apathy and generalised disinterest towards tasks involving sketching are also symptomatic. Inhibited individuals who do attend studio sessions are seen to avoid or minimise their engagement in the activity. In group situations, social loafing and allowing stronger individuals to take the lead is common. Reluctance towards sharing sketch information with peers and tutors is seen, individuals attempting to hide their output and being unforthcoming during critiques. Specific behaviours can be related sketch inhibition, an attitude of superiority - that sketching is somehow beneath the individual, and preciousness - the refusal to engage because the moment is not right - can mask apprehension and offer a route out of taking part.

Reluctance to sketch was a most apparent symptom. Those who engaged demonstrated anxiety around the activity in general and also in the production of marks, often demonstrating small or poor quality imagery. In such instances, sufferers sometimes held the belief that sketching was a talent rather than a skill, thereby mitigating their weakness. Fear was a significant symptom and expressed in ways other than sketch output, including specific verbalisation. Curiously, fear of failure extended beyond inhibited types to affect fluent students.

Social anxiety was a significant symptom, the sufferer becoming more aware of their shortcomings when involved with other people. Fear of judgement through criticism or belittling was apparent although quite clear that such judgement rarely materialised.

9.3. A Grounded Theory of Sketch Inhibition

Based upon the research conducted to date, a theory of sketch inhibition is proffered here: this is relatively tentative and is represented as a statement for discussion.

i. A definition:

Sketch inhibition is a phenomenon whereby the sufferer is reluctant or is unable to representational mark making associated with the cognitive activity of design ideation and development.

ii. The causes:

Sketch inhibition is identified to have multiple causes, of which one or many may affect the sufferer. Causes include a lack of exposure to sketch activity during childhood, an education system that favours academic subjects and continual testing and an assumption that it is intuitive and does not need to be taught.

The confusion between the activities of design ideation and visualisation, lack of theoretical understanding and a lack of awareness of the cognitive support of the sketch are also causal, as is the misapprehension that the ideation sketch is an artefact as opposed to purely representational of process. Digital tools are often used erroneously to replace the ideation process, presenting poor quality ideation in aesthetically pleasing formats, duping both sufferers and their tutors into believing they can replace such process.

Ill-qualified educators, themselves unable to use sketching effectively and thereby enable to teach this skill effectively perpetuate the phenomenon and the perception of creative subjects as lacking intellectual rigour, based upon a positivist paradigm of education, is complicit, thereby relegating sketch activity.

iii. The symptoms:

These are numerous and varied and typically include reluctance towards engaging in sketch activity, minimal output and poor quality ideation. Expression of fear, reluctance, absenteeism and social anxiety is noted, as is defensiveness, preciousness and need for perfectionism in output. Line quality is commonly affected and a preference exists for temporary mark making, such as pencil, that can be removed or amended. The use of verbal and textual representation of concepts is often apparent, either in support or total replacement of sketch activity. Digital output is often used to replace manual sketches, generally conveying very poor design ability, sufferers often having poor skills with such tools alongside sketch inhibition.

iv. The effects:

Sketch inhibition and the inability to ideate often exist in together within sufferers. Inhibition reduces the ability of the sufferer to engage effectively in the cognitive activity of ideation, there being no means to offload working memory or evaluate output. This reduces their ability to represent, analyse and develop conceptual information, impinging ultimately, on the quality of design solutions. Inhibition affects employability among sufferers, industry requiring a higher level of sketch ability than is generally presented among graduates.

9.3.1. Objective 6:

To develop a pedagogic framework for design education.

Thurlow & Ford's (2018a) paper; *Ideal Ideation: a framework for the management of sketch inhibition among undergraduate designers*, presented at the *Design 2018* conference, Dubrovnik, in May 2018, offered at the time, a three-level pedagogic framework proposal - see Appendix 1. The development of this is modelled in figure 34, below, showing the emergence of themes and their placement into nodes (within Nvivo) through open and axial coding, followed by selective coding of these themes to formulate the subsequent pedagogic framework.

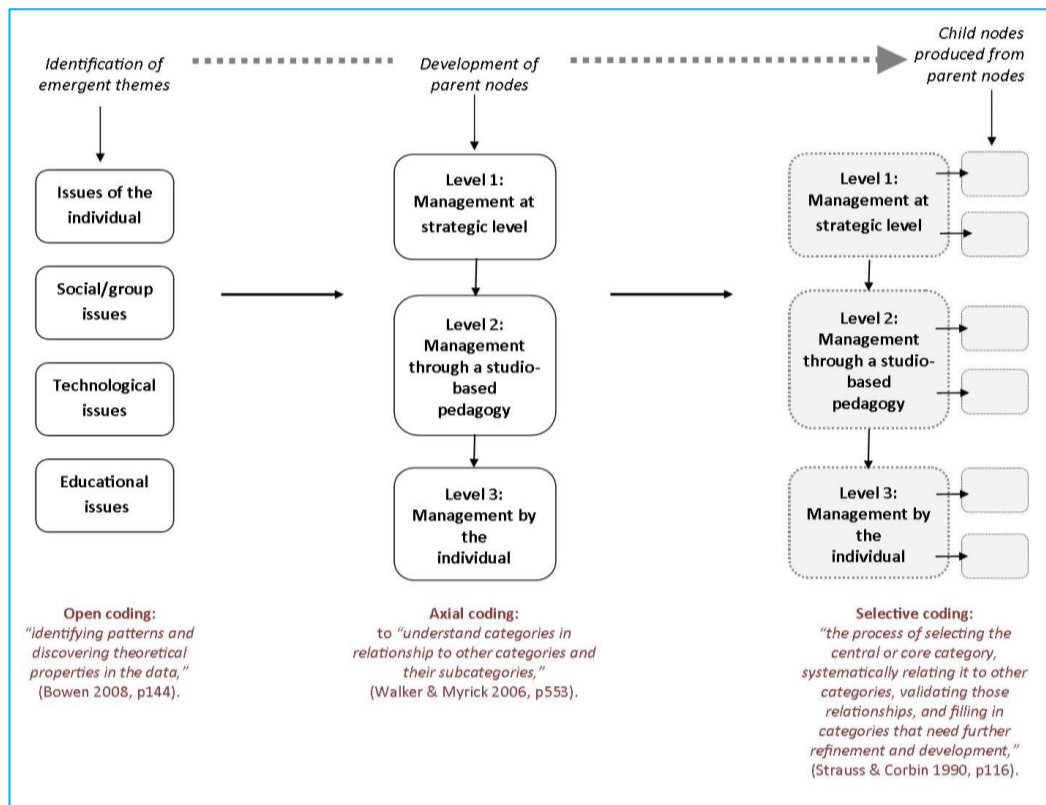


Figure 34: Development of the framework based upon the emergence of themes. Source: the author – originally published in *Thurlow & Ford, 2018a*.

However, since publication of the said paper as the study progressed, (and being a feature of Grounded Theory), a further two levels were identified within the data. Thus, in addition to management at the *institutional*, *pedagogic* and *individual* levels originally presented in *Thurlow & Ford (2018a)*, consideration of the philosophical paradigm of design education and the influence of education policy were also identified. The process of axial and selective coding utilised yet more mind maps, (two of which are presented here in figures 35 & 36 below).

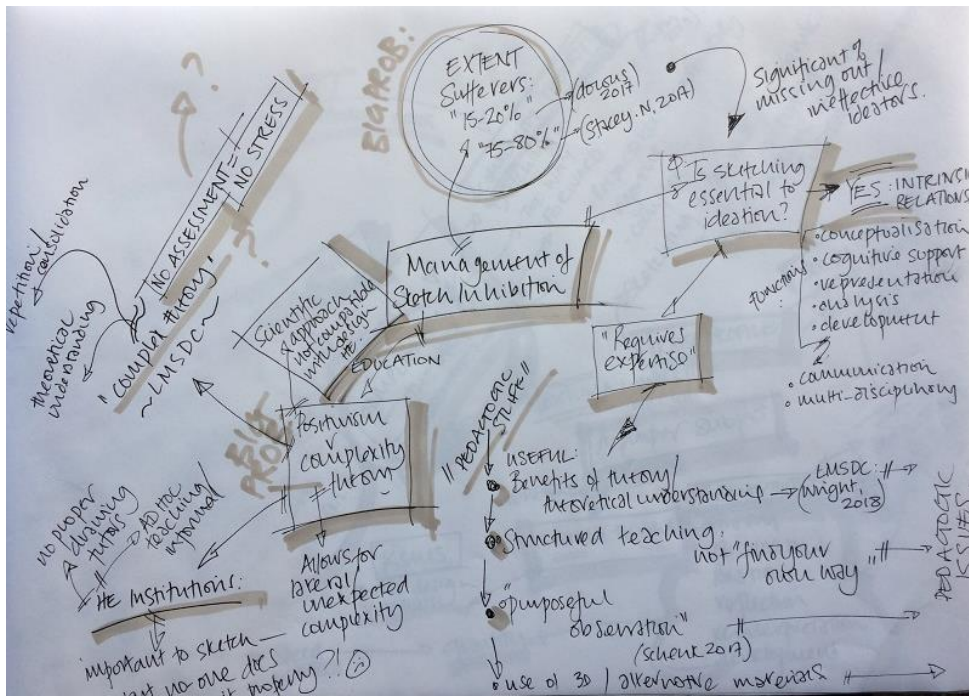


Figure 35: Mind map to show axial and selective coding of themes during development of the pedagogic framework. Source: the author.

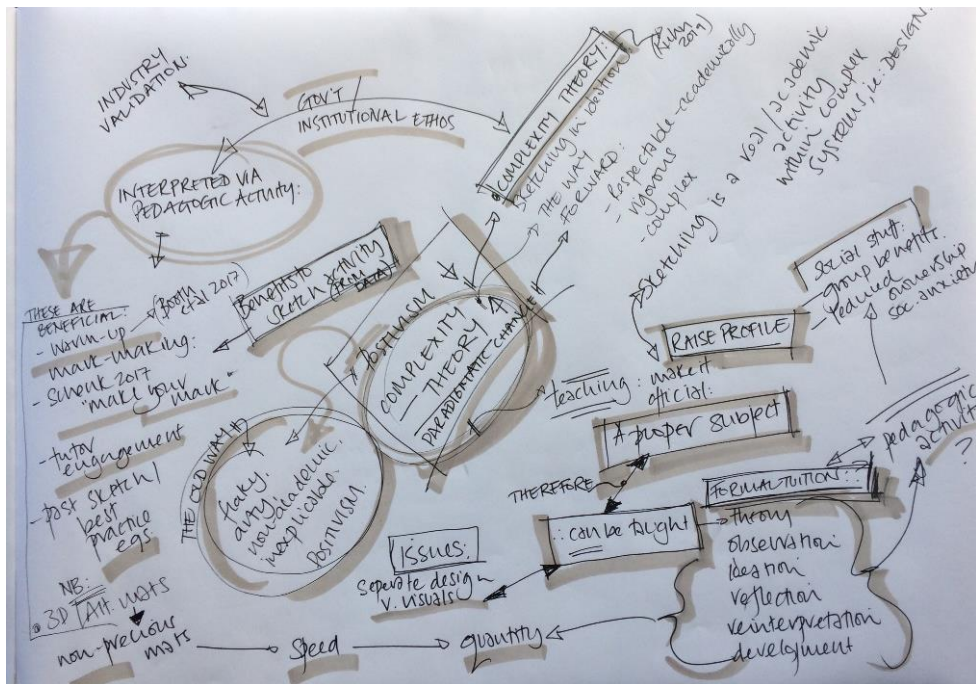


Figure 36: Mind map to show axial and selective coding of themes during development of the pedagogic framework. Source: the author.

9.4. Scope and purpose of the framework

The finalised pedagogic framework as it currently stands is presented below in model form (see figure 37). The stakeholders of the proposed framework fall into four distinct groups: 1. The inhibited student for whom ideation sketching is an issue and who wants to develop their skill set and fluency. 2. The educator, for whom sketch inhibition is evident and problematic, but who lacks understanding of its cause and effect and has no formalised tools to address it. 3. The HE institution, where students with sketch inhibition can be found struggling to design, or worse, are oblivious to their shortcomings, and 4. Industry, whose skill-set requirements of graduates is increasingly being unmet.

9.4.1. *Utilisation of the framework*

i. Level 1: Management at strategic level within HE institutions

For the pedagogic framework to benefit sketch inhibition, the support of the institution in which it is to be used is necessary. At this level, it would rely upon the acknowledgement of both the existence of sketch inhibition among students, together with the possibility that it can be addressed using the tools contained within the framework. This may be problematic as institutions may be unforthcoming in admitting the existence of sketch inhibition among its students; (this was apparent in feedback from two tutors from Delft University after presenting the paper, Thurlow & Ford (2017) at the Design Management Conference, 2017, Hong Kong).

ii. At level 2: Management through studio based pedagogy

The pedagogic framework at this level: *Management through studio-based pedagogy* is intended for design educator use during studio teaching sessions and is generic across design disciplines. Those tools shown in the model within blue boxes, i.e.; *'purposeful observation'* and *'use of 3D materials'* are discipline specific and described in their relevant sections below. Although the research has been conducted among undergraduates within HE, the tools tested to date could be applied within other

contexts where sketch inhibition is identified, such as within FE and secondary education.

Embedding tools contained within the framework into studio activities, either as stand-alone activities or by incorporating into project-based learning in a longitudinal structure throughout an undergraduate course would be beneficial. This approach would address the need for regular maintenance of skills. Module and course templates that allow for flexibility and the inclusion of such tools would enable these to be dropped into current curricula. Periodic review would also allow for renewal of and inclusion into modules and courses where current structure does not allow.

iii. At level 3: Management by the individual

The mind-set of the individual sufferer is vital to the successful underpinning of the entire framework. Their determination to develop skills and confidence in ideation sketching could be of benefit, particularly in group situations, where their progress can effectively recruit other sufferers into engage with framework tools.

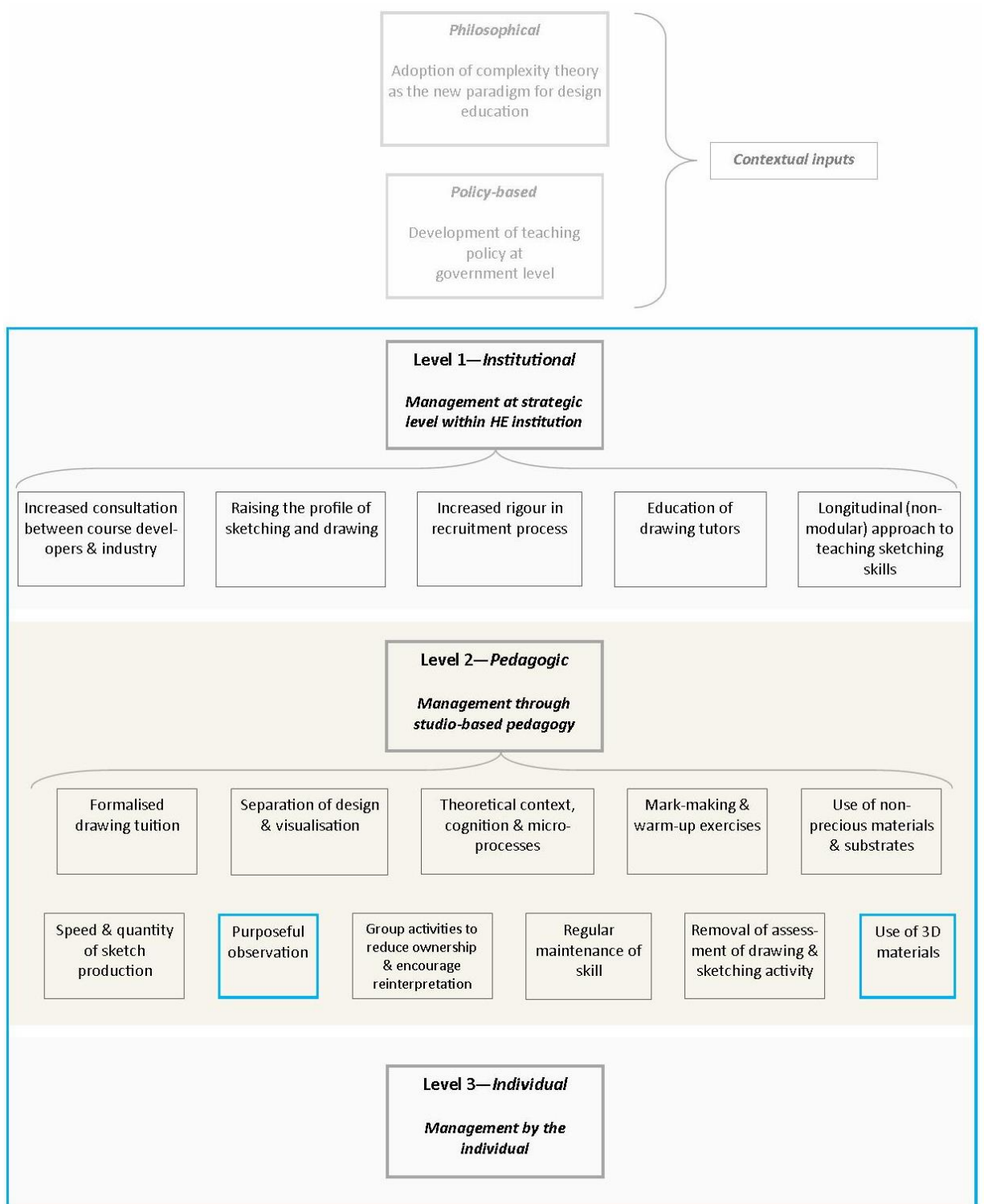


Figure 37: Proposed pedagogic framework for sketch inhibition. Source: the author.

9.4.2. *Contextual inputs to the framework*

Included in the above figure are two *contextual inputs*: those relevant to the development of the framework, but outside the scope of the research objectives.

i. Philosophical

Research by Kuhn (2008) and Wang (2010) into curriculum theory, suggests the need for design education to move away from a positivist approach and towards one of complexity theory. They believe the perception of creative subjects as lacking intellectual rigour can finally be overcome: *“in order for design education to become more rigorous – and more academically respectable – it must either become more rational or it must embrace a new paradigm that values creative experience.”* (Wang 2010, p173). The current education paradigm focuses upon objective rationality and within this, design and art subjects struggle to achieve respectability, also noting that educators within such disciplines feel marginalised, citing the *“smaller culture of the design studio and the larger culture of the university as a whole,”* (p176).

Wang (2010) suggested that, the tacit nature of information and irrational creativity that comprise design activity are problematic to positivists: *“as long as positivism is assumed as the paradigm for design education, the subjective and irrational...nature of design creativity can never be defined and explicated. If this is so, the full glory of academic respectability will always elude design education,”* (p180).

However, by adopting an alternative approach based on complexity, design problems can be viewed as complex systems requiring exploration, thus providing them with increased intellectual respectability. Kuhn (2008) describes complexity theory as deviating from traditional linear, objective approaches to the world, instead considering, *‘a tightly bound, mutually inducing pairing of cause and effect’* (p182), and more appropriate for apprehending issues related to the apparent chaos of contemporary social structures.

Wang (2010) describes the atelier system, originally developed by the *École des Beaux-*

Arts. This is now standard method for architect and designer education, separate from the rest of university education and often attracting criticism because of its informality. The intellectual irrationalism inherent in design activity - as Wang (2010) Cross (2001) and Dubberly (2004) describe, "*the creative leap*," - is the point between analysis and synthesis where, according to positivism, design and creativity lose their credibility.

By proposing complexity theory as the paradigm within which creative subjects function, this would facilitate invention, spontaneity and unpredictability typical of complex social, real-world environments. Using this approach, design education could, "*incorporate spontaneous invention as a natural feature of the process... (to) unite science and art and thereby bestow intellectual rigour upon the activity of the design studio*," (Wang 2010, p179).

ii. Policy-based

Although it was not the remit of the study to investigate this particular area, due to the Grounded Theory approach it emerged as a clear theme and one requiring extensive investigation. The time constraints placed upon the study required the prioritising of research activities according to the objectives. As the legislative aspects of design education did not form any of these objectives, it was decided this should be set aside. This is considered in the following chapter under the section, *recommendations for further research*.

9.5. The framework tools

Some of the following framework proposal was presented in Thurlow & Ford (2018a), and continued to be developed after this. The following is presented as a more highly resolved version of the initial framework.

9.5.1. Level 1: Management at strategic level within HE institutions

As previously suggested, the pedagogic framework relies upon acknowledgement by and support from the institution within which it is to be utilised; this section presents approaches based upon the research.

i. Increased consultation between course developers and industry

The apparent tension between the need to generate revenue on the part of higher education institutions and the requirements of design professions is problematic. Although institutions maintain they consider the needs of industry and clearly do to a point, their existence as independent commercial enterprises can, understandably, override such considerations. Education and job training are separate entities, the former being the remit of higher education and the latter outside the scope of this study. However, the need to provide industry-effective graduates has never been more important and worthy of greater collaboration.

ii. Raising the profile of sketching and drawing

Where the teaching of digital methods is clearly defined on the curriculum and taught prescriptively, the same priority is often not given to manual tools, such activity often embedded within other modules. While educators endorse their importance, the reality within studios is often very different: disparity between its teaching and learning even within single institutions symptomatic of issues at strategic level. The collective development of a definitive, tangible educational strategy for sketch activity could reinforce its importance. Increasing the amount of sketch material presented alongside design output and at degree shows and exhibitions – (currently observed as hidden at the back of portfolios or excluded altogether), could increase its profile.

iii. Increased rigour in recruitment processes

The observation of bottom lines means universities must compete for students to meet their targets - the upshot being that students are entering higher education less well-equipped and without the basic skills from which to grow. In a system where the provision of design courses has increased and institutions are vying for students in

their numbers, the proportion of students entering higher education with good drawing ability is inevitably shrinking. An increase in rigour, in an ideal world, would enable only the most capable and those with the most potential to partake in design education. However this is unlikely to happen, so, despite implementing drawing tests and evaluation of sketch ability during interview, it is unlikely that such increased rigour could ever be implemented.

iv. Education of drawing tutors

Tutors unable to use draw effectively perpetuate the minimal level of skill from which emerging designers are able to benefit and the tendency is for design drawing, unlike fine art, to be taught by generalists,. The issue here is how to develop effective drawing tutors: the current fine art system, although not completely appropriate for design drawing education, could still provide the basis from which observational drawing could be taught. However specialist tutors for design drawing still appear to be needed - the example presented by the case study with Leicester Media School Drawing Centre being exemplary and potential example of best practice. In the meantime, where to begin educating current tutors, bearing in mind their workloads, willingness to participate and inclination to learn to draw all, is a conundrum. However, the awareness of such a lack, and the importance of the need to address this is an important starting point.

v. Longitudinal (non-modular) approach to teaching sketching skills

The place of the modular system in compartmentalising learning experience and the effect it has upon imparting the maintenance of sketching and drawing skill over the long-term needs to be reconsidered. The details of this are considered in the next section, *9.5.2 Level 2- Management through studio-based pedagogy*. However, at institutional level, structuring sketching activity separately from other modules could be beneficial. Presenting it as a longitudinal activity throughout degree courses, as opposed to a week-long crash course, a single semester module or an activity only for first year students would help to endorse its importance and improve engagement. The

practicalities of this are not considered here, but the benefits of regular drawing maintenance are clear and needs to be incorporated into courses on a long-term basis.

9.5.2. *Level 2: Management through studio-based pedagogy*

The proposed framework tools are presented here and subsequently tested in the next section; 9.6 *Testing framework tools: action research using teaching & learning practice*, where findings and discussion from this process are considered.

i. Formalised drawing tuition

The benefits of formalised drawing tuition within design higher education have been proven by the data and where formalised drawing tuition is given, this does impart necessary skills to students. By contrast, the practice of allowing students to find their own way results in increased inhibition. Therefore a formalised approach to teaching such skills across departments and schools within institutions would appear beneficial. The practice of Leicester Media School Drawing Centre, providing a constant standard of tuition relating to theory, experimentation and practice, was having a positive effect upon inhibited students. An approach such as this across an entire institution could address variations in teaching and provide students with equality of experience. The teaching of observation skills and using site-specific activities outside of the traditional studio environment are recommended, as is a delivery style using both fast paced and more relaxed activities, observing the relationship between ebb and flow and its benefit to teaching and learning.

The informality of attitude pervading sketching and drawing, specifically within design education is also problematic. Although contentious an approach similar to that of the traditional art school whereby skills are taught formally, based on a single cohesive strategy could be an answer.

ii. Separation of design and visualisation

Increased clarity and delineation between design ideation and visualisation is necessary at the point of module development and during teaching and learning

activities within such modules. These two endeavours rely on entirely different cognitive processes, their output created for very different purposes. Sketch production during ideation, by default, produces representation of concepts, and these are often unfavourably compared with entirely representational visuals produced much later on. Currently the blurring between these two activities is evident within modules and between modules on the same course, causing confusion to students and making the process of ideation appear less important.

iii. Theoretical context, cognition and micro-processes

A lack of understanding among educators regarding these functions results in students having little understanding of why and how sketching benefits ideation. Where theory is taught, specifically within Leicester Media School Drawing Centre, students' increased understanding benefits both their intellectual and practical understanding, and improves the academic rigour of sketching and drawing, something that even weaker students were willing to appreciate. Using theory within a wider programme of structured teaching endorses sketching as a proper subject, less likely to be viewed as a talent. Improving the student's relationship with such activity is more likely to encourage its use, thereby reducing inhibition and encouraging fluency of ideas. It also provides a framework with which to deconstruct images and interpret visual information, this, aside of ideation activity, and beneficial to the visual arts beyond that of design.

iv. Mark making and warm up exercises

The reduction in anxiety and physical inhibition during sketching are benefited through mark making activities and warmup exercises prior to such activity. By focusing attention on mark making as opposed to producing sketch output, inhibited individuals are distracted from that inhibition and towards the indexical quality of the individual materials they are engaging with. The perception of such activities being less serious than those of design alters the approach of inhibited individuals; a sense of being carefree and less grown-up acting as a release from anxiety and tension.

v. Use of nonprecious materials and substrates

The sketchbook itself, with its expensive paper and bound format creates inhibition, the fear of spoiling the page and thereby spoiling the entire book weighs heavy upon the inhibited student. Even fluent, experienced sketchers suffer this. The introduction of cheap materials that can be easily disposed of reduce the anxiety around failure and the making of mistakes. Such inexpensive substrates and unsophisticated mark making tools, including charcoal, marker pen, children's paint sets, cheap newsprint and sugar paper dispel the sense of preciousness and again, create a less grown-up feel about mark making. Although nonprecious in nature, the resultant marks provide a valuable starting point for development into more fully developed concepts, demonstrating that the value is in the process and not the artefact.

The use of digital-based sketching media may be benefits to inhibited students. The traditional sketch could be updated or hybridised with tablet and stylus-based digital tools, thereby fulfilling the learning preferences of Generation-Y students. This could forestall the tendency for inhibited students to defer to digital methods, thereby enabling them to engage in a familiar medium whilst developing the designerly idiolect necessary for successful ideation.

vi. Speed quantity of sketch production

The use of sketching as a fast method of representation supports ideation, undoubtedly, and practice is required to reach an effective standard in its use. Inhibited students fall foul of this by trying to produce perfect images and being precious with materials and processes. By using speed to force mark making, their attention is once again, drawn away from the result of their mark making and onto the need to replicate mental imagery as quickly as possible. The anxiety caused by trying to output mental imagery in sketch form as quickly as possible distracts from the preciousness of their production. Quantity is also beneficial for encouraging growth of ideas, but also the pressure of production again refocuses attention away from the

aesthetic qualities of output. Both of these methods are effective in refocusing the individual's attention from artefact and onto process, thereby reducing inhibition.

vii. Purposeful observation

The debate around the relevance of observation drawing using a fine art approach led to the initial assumption that this was probably unnecessary for designers. However, as close observers of human behaviour and environment, and dependent upon discipline, designers require a clear and effective repository of observed information within their long-term memory from which to draw. By requiring students to engage in such activity as a process of information gathering - as opposed to one of artefact production - their observational skills are developed. Use of life models may or may not be appropriate, according to the discipline in question, despite requests from some students for this type of drawing. The proximity of the user and their relationship with a design solution varies according to discipline; this is reflected in the relevance of life drawing to that discipline. The fashion designer has a very intimate relationship with the human form, (probably the closest of all disciplines) and requires specific understanding of shapes and anthropometrics. As such, traditional life drawing may be most appropriate in this instance. The jeweller, product or footwear designer produce solutions closely modelled according to specific parts of human anthropometry, and therefore, life drawing specific to these needs may be relevant. Interior design and architecture have a looser relationship with the specifics of the human form and may require less specific observation of such detail. Regardless of discipline, observation drawing enables the individual to develop their own method of measurement and replication of external percepts, without which struggle to observe the world. Therefore, observation drawing is in fact highly relevant to design activity alongside mental imagery used during ideation.

viii. Group activities to reduce ownership

The benefits of group exercises with sketching and the sharing of sketch material support a reduction in inhibition - these could be imparted more deliberately across

courses within specific drawing and sketching tuition. Although fear of peer judgement within group based activities might appear to compound inhibition, this rarely manifests. In reality, the support and inspiration that students can garner from peers during group sessions outweigh this and needs to be built upon. The reduced sense of ownership from sharing sketch material during group activities reduces inhibition, various anxieties and perfectionism towards outputs being put aside. The gamification of sketching activity, is also beneficial, the element of fun distracting individuals away from their anxieties. Additionally, the use of shared sketch material from previous students used as a tool for demonstrating best practice is highly valuable. Such a simple teaching tool provides a benchmark for level of attainment, the demonstration of possibilities, and evidence that this is achievable. Tutor engagement in sketching activity during teaching sessions is also invaluable, providing that the tutor has skills of a high enough standard to exemplify the practice.

ix. Regular maintenance of skill

This is currently, seriously lacking - the assumption being that students will apply taught material by themselves, under the guise of *embedded* activity within other modules. However, students' typical lack of prior drawing experience, the lack of tuition prior to higher education and their inability to retain instruction make this assumption highly spurious. Maintenance of sketching should be provided, both regular and ad hoc. Regular sketching activity involving mark making, purposeful observation, representation of mental imagery and the reflective analysis of imagery should exist constantly throughout the degree experience.

x. Removal of assessment of drawing and sketching activity

Although contentious, the removal of assessment of drawing and sketching activity within courses would remove one of the biggest anxieties surrounding the activity. To approach it as a language aside from design activity could benefit students, allowing them to engage and explore without the fear of making mistakes, judgement, and having work deemed as either right or wrong according to the prevailing positivist

paradigm of higher education. The development of an idiolect and the confidence to apply it fluently is the very thing that design courses set out to create. However, the current assessment driven, mostly modular approach to higher education destroys confidence and willingness to experiment with such a personal activity. The approach of Leicester Media School Drawing Centre of providing feedback without involving any assessment is one to be emulated, despite the this style of teaching and learning would create were it to be applied more widely. Without even intending, students are engaging with complexity theory demonstrating this approach to teaching and learning as potentially effective.

xi. The use of 3D materials

Throughout this study the use of three-dimensional materials, specifically model making and the use of found objects emerged as a highly relevant and beneficial method of ideation. Despite the initial definition of sketching as being only two-dimensional, thereby excluding this type of articulation, its function for the representation of mental imagery, analysis, communication and development of concepts is undeniable. The three-dimensional model provides the same functions as two-dimensional imagery, but additionally, without the need to convert this within mental imagery – and this could be of great value to designers of three-dimensional solutions across many disciplines. The study recorded the benefits of the three-dimensional sketch models among inhibited interior design students – particularly those who struggled to replicate mental imagery, but the benefits of such an approach could be applied to a wider student group, specifically interior, architectural, product and furniture design. To consider the sketch as only a two-dimensional entity would now appear restrictive and inappropriate; non-traditional materials and methods providing a source of inspiration and representation that should not be overlooked.

9.5.3. *Level 3: Management by the individual*

Despite sitting at the foot of the proposed framework, a positive attitude of the individual towards their education is essential. This is effectively where the framework

is at its weakest: if a strategy for the management of sketch inhibition is adopted, it can only be successful if uptake among undergraduates is widespread. Although the data evidenced an increase in immaturity and less self-reliance among undergraduates, these are exactly the qualities required for the effective engagement in the proposed pedagogic activities. Inhibited individuals who remain absent and fail to engage in sketch activity at any cost may not be saved. However, the framework does give a fighting chance to those with the motivation to make a change. This issue is a complex one and this study is unable to provide concrete answers to it.

9.6. Testing framework tools: action research using teaching & learning practice

At this point in the research, and according to objective **6: *To develop a pedagogic framework for design education***, testing of the proposed framework was necessary. Findings from the 'Action research using teaching and learning practice,' the methodology for which is described in chapter 3, is presented here. Findings are presented as observations made during the exercises and through module feedback provided by students as part of the university's quality assurance activity. A model showing the position of the activity within the entire study is presented below.

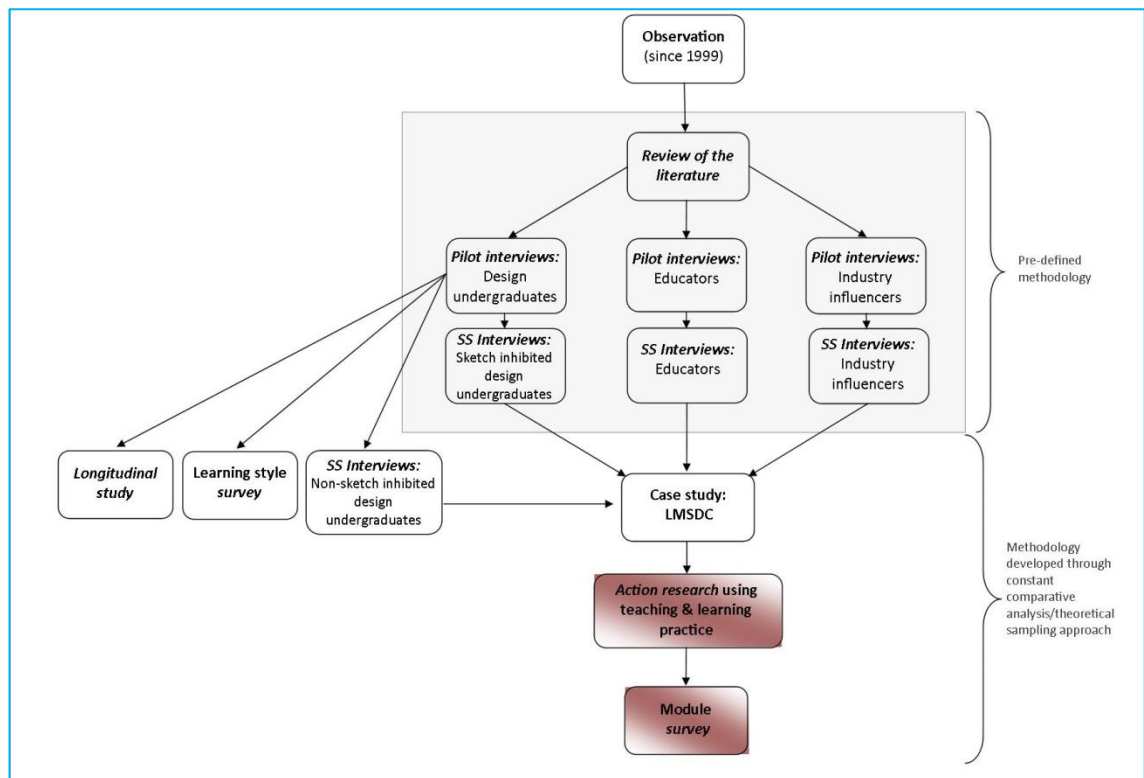


Figure 38: Position of the action research within the Grounded Theory approach. Source: the author.

Although positioned within the conclusions to the study, (the action research superseded the formulation of the framework as part of objective 6), it was considered appropriate to place these together:

9.6.1. Observations of the teaching & learning practice

Exercise 1: Mark-making exercise. Intention: to reduce inhibition and anxiety towards mark-making.

Observations: There was a large variation of approach between subjects. Some worked tightly on A4 substrates using small marker pens, pencils and liners and remained in their seats throughout. Some used A3 and A2 substrates and made as much mess as they could, utilising the space within the studio.

Novel use of materials was seen among some subjects: some cut potatoes into shapes to print with, some used sponges to create marks they then embellished with other materials. Mixing media was observed among those subjects who were using more novel approaches to the activity.

Subjects all looked at their peers' efforts as the exercise progressed. This produced positive comments about the aesthetic of others' output, and some negative self-talk.

There was talk between subjects about use of materials, and how these could be combined or used in a novel way.

Some subjects expressed enjoyment of the activity, some stating that it reminded them of their childhoods. Some were clearly uncomfortable, stating they thought the process to be childish.

During the group critique, subjects showed interest in each other's output and this drove discussion between them about their mark-making.

Exercise 2: Observation. Intention: to improve observation of external entities, improve mark-making skill in response to observation of such entities.

Observations: *Some subjects expressed dread at the prospect of the exercise.*

Use of erasers was common despite not being permitted, subjects using them both openly and surreptitiously.

One subject asked if she could be excused from the session so she could do the exercise away from the class. She returned with a pencil drawing of an oak twig and leaves but gave no explanation as to where she had acquired the artefact or done the drawing, (there being no oak trees in the vicinity of the university).

Subjects were required not to render or embellish their still life studies, although many attempted to. One spent the entire session rendering and shading despite this instruction.

One subject failed to engage in any of the activities maintaining she was tired and not in the mood.

The majority of subjects said they had never done this type of exercise before – despite having already completed undergraduate and further education courses in similar disciplines.

Many subjects struggled to find a systematic way to observe the shapes they were asked to draw. Upon being shown how to do this, they expressed relief at knowing what to do.

Many subjects expressed relief at the end of the exercise and stated that they had found it difficult.

Exercise 3: Recording mental imagery. Intention: to encourage use of and fluency in mental imagery.

Observations: *Some subjects clearly felt self-conscious at being asked to close their eyes.*

One subject spent far longer than the others with her eyes closed, (to the point that she was asked if she was alright). Afterwards she expressed how much she had enjoyed the activity and that it was unlike anything she had done before.

Some subjects rushed the exercise. Some took their time and were observed to close their eyes and revisit their imagery.

Some subject described their experiences of their mental imagery. Some expressed enjoyment at doing the exercise.

Some subjects expressed interest in using this method in the future.

Upon critique, subjects discussed the process and their output between themselves. No evidence of negative comments was observed.

Exercise 4: Comparative interpretation exercise. Intention: to reduce inhibition involving peer judgment.

Observations: Some output appeared to be very small on the substrate, i.e.; not filling the page.

Subjects were observed to look at each other's output during the exercise.

Evidence of aesthetic judgment was apparent: comparison between the output of individuals was seen.

Some expressed negative self-talk, some made positive comments about others' output.

During the critiques, subjects discussed their output with each other. Positive comments were observed – there was no evidence of negative judgment of any output.

Exercise 5: Reinterpretation. Intention: to encourage the use of interpretation and reduce ownership of sketch output.

Observations: Many subjects expressed enjoyment in doing the exercise. Some described it as being like a party game.

As the exercise progressed and students mark-made over the sketches of others, any previous evidence of preciousness disappeared.

The level of ownership, or possessiveness towards output declined as the sketches were passed between subjects.

Subjects became more vocal, discussing their interpretations of peer's sketches and how they were developing them.

Positive comments were made about the output of others - no evidence of negative comments was apparent.

9.7. Conclusions

The teaching and learning exercises proved very enlightening. Regarding the management of sketch inhibition, they appeared to have been of some clear benefit. The lack of structured teaching of drawing and sketching was evident and of concern, particularly in the observation exercise where many students had no idea of how to go about observing and representing simple three dimensional shapes. This suggested their ability to observe and interpret more complex structures – including those that they may wish to apply to their designs – may be impeded. It also suggested that their skills of analysis may not be as developed as they could be.

Levels of enjoyment varied according to the exercise. The observation exercise appeared to create most anxiety. A lack of experience of observation drawing, and the comparative nature of such drawing, (between the objects and representation as produced by the subject), produced some negative responses. This, coupled with the relief expressed by some at being shown how to observe and reproduce imagery, would propose an area where greater teaching is required.

The levels of constructive criticism and lack of negativity between subjects was interesting. There was no evidence of negative or unhelpful criticism of each other's' work – in fact the studio sessions appeared to engender greater cohesion and support between individuals which may prove beneficial to their further learning. This would suggest the use of studio sessions such as this would be of future benefit.

9.7.1. *Module feedback*

This is presented as raw data collected from module feedback questionnaires and was supplied in an anonymised format by De Montfort University, hence no references are presented. In answered to question: *“What are the best things about this module?”* the following responses were elicited from the 2016-17 group, (in no particular order):

"The concept of developing basic drawing techniques"

"I tried different drawing methods that I never used, and teacher let me know how to use different to develop own inspirations"

"Brain storming to drawing"

"Challenging the way we think about design communication, through either generating or presenting ideas"

"[Deleted staff name] is a very positive influence and gives us lots of food for thought, regarding the way in which we make marks and communicate as a designer"

"The freedom to explore different concepts and ideas through experimentation"

"No right or wrong in this subject. Guiding our way through the design process"

"Being challenged to think in a different way. We are encouraged to express ourselves though mark making and mediums"

"Helped me with communicating my design process better. Helped me to take the courage and try new medium of sketching putting my thoughts on the paper"

"I could find something special and possible by childlike activities"

"Drawing skills are extremely important to be able to design and express your thoughts. This module reinforces that"

"[Removed staff name] is perfect for this module. [Their] experience and enthusiasm for the subject is contagious"

"Letting you experiment with different mark making and how you can communicate design differently. It helped me to find my illustrative style"

"This module has asked us to trial, test and investigate what methods best communicate our designs. It has asked us to critically reflect upon what tools and substrates we use and what we deem to be the most effective"

"The mark making exercise was good to assess what materials may be most appropriate"

"This module shed light on different ways of communicating design. It focussed on parts of design which are neglected and tried to bring them into focus in order to create a bigger impact. I enjoyed this module and it helped me overcome a lot of my fears"

"This module focusses on getting over the inhibition of sketching and gain confidence in that area"

"I learned how to use different ways to show my ideas and also I did a lot of practice."

The question: *"How could this module be improved?"* elicited the following comments:

"More messy mark making in lessons please. maybe group expressive work? collaborative painting/ designing would be nice"

"More interactive activities every week. Activities relating to the theories that are being taught"

"More practical sessions."

The 2017-18 group were asked the question: *"What have you most liked about this module?"* which elicited the following replies:

"Developing skills, through illustration and testing through skills and substrates"

"I have enjoyed the theoretical aspect of the module most of all. I feel that I have a much deeper understanding of communication whether that be visual, verbal or written and I found it really interesting"

"Liked the mark making opened new areas should be able to continue this and be inspired by what we did and relate to design work"

"Mark making and experimentation of ideas"

"The different tool usage and thought process in marking"

"Use different material to drawing"

"This module helped me to communicate with my design ideas in a different way. Few design process that were learnt in this module were fun and creative."

In answer to question, "What would improve the module?" the following was elicited:

"Feel the mark making was a waste and not confident of passing"

"I think the use of exemplar work from earlier on in the module would help with expectations and perhaps more practical tasks that have a direct link to coursework. e.g. the mark making session which linked nicely to the compendium."

9.8. Conclusions

Although, at times, the action research during studio sessions with students was challenging and involved a good deal of flying by seat of one's pants, the module feedback received from both groups was surprisingly positive. The appreciation of new skills was evident: "basic drawing techniques," and "different drawing methods that I never used," being cited. "Freedom to explore," "experimentation," and "practice," were mentioned, suggesting a possible previous lack of these. The theoretical (lecture based) part of the teaching & learning practice appeared to enable a "deeper understanding," of sketching and the relationship between theory and practice appreciated, suggesting this could be built upon. In particular, the reduction in fear and an increase in confidence that were noted endorsed the benefit of the exercises, mirroring the observations of studio sessions as a means for management of sketch inhibition. The request for "more practical sessions," and "more messy mark making in lessons," was also noted, (despite one objection that it was a waste of time, but you can't please everyone), suggesting that whatever the level of student, practical exercises around mark-making were of benefit. This also suggested that such exercises may benefit a wider cohort, and not just those with sketch inhibition.

To conclude, the application of the pedagogical framework proved generally successful and had a positive effect on inhibited students. The fact some of them even appeared to enjoy the process was a bonus and a highly beneficial aside from the framework - demonstrating its ability to positively affect individuals and encourage engagement.

This chapter concludes the discussion regarding the development of theory of sketch inhibition and the pedagogic framework. The following chapter considers the study in broad terms from a methodological and personal basis.

Chapter 10: Conclusions & Final Thoughts

10.1. Introduction

This chapter concludes the study. It presents the specific contributions to new knowledge, observations of the methodology, identifying areas where weaknesses may have influenced the findings. It also acknowledges the effects of the researcher upon findings and their interpretation and offers recommendations for further study.

In presenting findings in response to Objective 7: *To what extent does the use of Grounded Theory conflict with the requirements of traditional PhD study?* - (the additional objective identified within the introduction), the tricky relationship between these two entities is discussed. A proposal for further outputs based upon the study is also included.

As is the tendency with most PhD studies, the intention to find answers and watertight solutions to problems was intended at the outset. Unsurprisingly, most of this, in reality was unachievable: the solving of huge and pressing world problems had to be sacrificed for conducting a modest piece of research that would answer the requirements of a PhD.

During the process of the research it did become clear that in attempting to answer the objectives, further questions became apparent and equally pressing. The restrictions of time meant a line had to be drawn at some point, the result being a piece of research which, although addressing the phenomenon of sketch inhibition to some extent is relatively flawed.

10.2. The contributions to knowledge

The study has culminated in three specific contributions to knowledge. The first two, were intended contributions according to the proposal for PhD study, and include the *Grounded Theory of Sketch Inhibition* (as presented fully on page 235) and the *Pedagogic*

Framework for Educators (page 237 onwards). In addition to this, the emergent contribution has come about through the use of Grounded Theory to undertake the study and culminates in a methodological understanding of Grounded Theory used for doctoral research into design. This is explained fully in 'Objective 7: *To what extent does the use of Grounded Theory conflict with the requirements of traditional PhD study?*' (page 266).

10.3. Observations of the methodology

The literature in relation to methodology warrants particular mention. As already confirmed by Downs (2017), the lack of a specific design epistemology requires the borrowing of models from other disciplines, commonly the social sciences. Many of the methodological papers came from this area, and in particular, nursing provided the largest number of papers in relation to Grounded Theory and the primary methods. A model showing the relative volumes of useful data acquired by the various methods is shown below (figure 39).

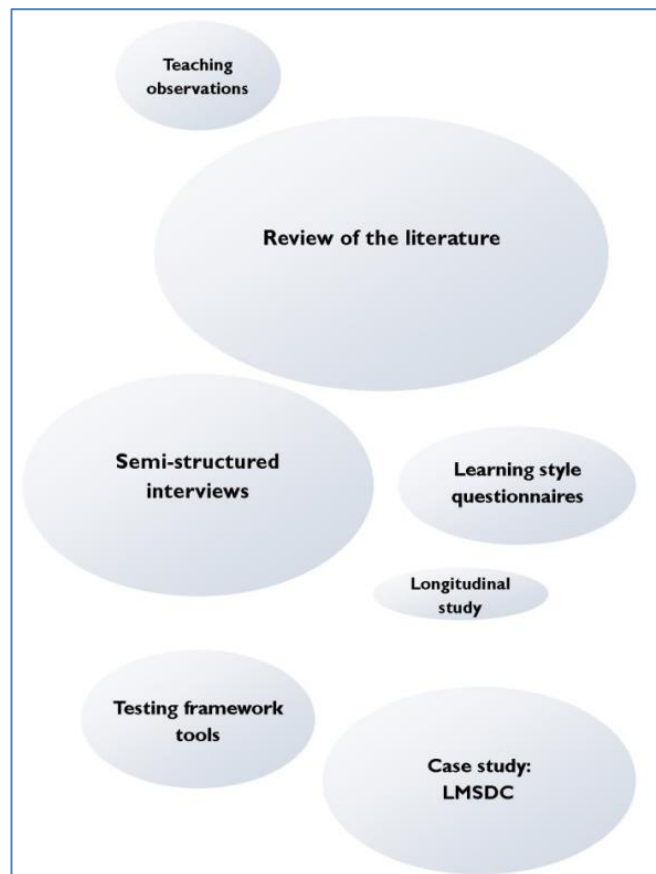


Figure 39: Relative volumes of useful data according to method. *Source:* the author.

The largest volume of useful data was acquired from the literature. Although providing very little data related to sketch inhibition specifically, its benefits to the context and understanding of sketching at the outset of the study was of vital importance. The semi-structured interviews and case study with LMSDC were of enormous value to understanding sketch inhibition - the soft, human issues of inhibition relied on such an approach to gain depth.

The semi-structured interviews provided not just usable data for the study, but also insight into the problematics of conducting such research. Particularly among the industry subjects, a tendency for digressing and recounting lengthy past experiences was observed and sometimes difficult to manage. Transcribing the recordings and

extracting the useful data proved subsequently, the most time-consuming part of the study.

Interviews with students were fairly problematic, offering much less useful information than expected. It was possible their lack of maturity and experience may have affected the way they responded to questions, their general understanding of sketching and design being surprisingly poor. It was assumed that interviews with sufferers of sketch inhibition would provide both breadth and depth of data, but this was not so: it is safe to say that students simply didn't know what they didn't know. On occasion the frustration with some student subjects having so little to say created the tendency to ask leading questions, just to get a response, and has this had to be monitored carefully to avoid corruption of the data. The problems of compliance among the student interview sample being considerable could be considered part of the lack of maturity demonstrated by this group.

The quality of data acquired from educators was extremely high, and the emergence from this of the case study with the Leicester Media School Drawing Centre, and Chris Wright in particular, provided the most useful data. These two methods provided the bulk of data utilised for the development of the management framework.

The least beneficial activities were the learning style questionnaire and longitudinal studies. As already discussed in their relevant chapter, they merely dipped into the issues, and although provided good indication of the benefit of future study, provided very little insightful data on their own.

10.3.1. *Personal agenda and bias*

"Research is never neutral, for it involves the ontological, epistemological and axiomatic assumptions of the researcher," (Kuhn 2008, p179). Personal agenda, bias and influence was difficult to monitor. Fassinger's (2005) observation of the researcher's need to be fully aware of their biases when using a Grounded Theory approach was almost impossible to execute. Such beliefs clearly affect perception of the world and will

ultimately affect the outcome of this study – however, the extent to which they have been consciously allowed to impinge upon the study is, hopefully, negligible. The unconscious effect of personal bias is impossible to quantify, as is the case with all researchers - this does not negate the relevance of the findings; it just creates a layer through which they must be observed.

Being engrossed in data extraction, coding and interpretation did not easily allow for constant macro-analysis and identification of these issues. This suggested that research output should never be considered definitive, but a small part of a fluid and ever-changing body of knowledge. Even the simple use of a quotation can be skewed according to the requirements of the researcher: had this study being conducted by a researcher without sympathy towards sketching, it is very possible that sketching would not have been considered important to the design process at all. This raises bigger ontological questions than can be considered here and also places a greater responsibility upon the researcher than was acknowledged at the outset of this study.

10.4. Objective 7: *To what extent does the use of Grounded Theory conflict with the requirements of traditional PhD study?*

In simple terms, Grounded Theory and the traditions of positivist PhD study are incompatible. As already suggested in the introduction, the institutional requirements preclude the use of this approach in its purest form, so concessions had to be made. The greatest influence of institutional positivist requirements was on the research proposal and the structuring of information as a result of that research. Henwood & Pidgeon (2003, p-) state: *“The excitement and challenge of GT is finding a way out of its maze, but there is no one legitimate way out of the maze,”* - but this does not necessarily make for a compliant study. The points at which the friction between Grounded Theory and PhD study has most problematic were identified during the process as:

10.4.1. *The research proposal*

This appears to be the biggest problematic of Grounded Theory versus positivism within such a study. Had a purist approach being taken, the research would have been forced to ignore institutional requirements for a fully developed research proposal and for a formal review document detailing research undertaken and proposed at the end of the first year of study. A purist proposal containing nothing more than an area of interest to apprehend using a Grounded Theory approach would have been presented and, understandably, dismissed. The requirement for this within a positivist approach is however, understandable; a PhD proposal needs to withstand scrutiny and requires a framework within which this can happen.

10.4.2. *The management of data*

Fassinger (2005) described the complexity of data handling within a Grounded Theory study as potentially problematic, the use of software mitigating some of this, as suggested by Charmaz (2000) and NVivo was used continually for the storage, management, coding and analysis of data. The ability to visualise data using NVivo's graphic tools was essential for interrogating the large body of data generated by the study. Although Charmaz (2000) warned that management software "*may unintentionally foster an illusion that interpretive work can be reduced to a set of procedures,*" (p520), this did not appear to be problematic, emergent themes, rather than software, driving the process.

Fernández & Lehmann (2005) observed that the use of Grounded Theory requires the researcher to tolerate confusion, regression of the research process and to conceptualise in order to develop theory from the data. They also considered creativity as important for the acquisition and analysis of data. This was certainly reflective of the study and challenged more traditional linear approaches used in previous projects.

10.4.3. *Structure of the thesis*

As already described, thesis structure has to conform to very specific requirements. Surprisingly, these requirements appear to have never been challenged, despite

pouring through many theses. Although tempting to take a chance and present the study in a non-linear format truly reflective of Grounded Theory, this was ultimately considered foolhardy: too much was at stake.

10.4.4. Timeframe of PhD study

Grounded Theory activity within a time sensitive environment is problematic and this factor certainly impinged upon the study. Had time been unlimited, the study would have continued, the body of data and findings growing way beyond those presented here, and forming a truer reflection of the possibilities of Grounded Theory for this research.

Time restrictions were particularly apparent during the learning style questionnaire and the longitudinal study. Had enough time been available, a good deal more research into these methodologies would have been undertaken. This seemed to be a constant struggle; the joy of identifying a new area to research coupled with the lack of time available to research potential methodologies.

10.4.5. The potential benefits of complexity theory to Grounded Theory research

Acknowledgement of complexity theory, according to Kuhn (2008) Wang (2010), as the preferred paradigm for design education, (as already discussed in the previous chapter), could in addition, benefit the study of such subjects. It would also appear that Grounded Theory could have a good relationship with complexity theory; both able to accommodate complex, creative and non-linear systems and allow for the emergence of unexpected data. With this in mind the accepted positivist paradigm could be replaced by complexity theory for underpinning the structure and presentation of research into creative issues. Institutions endorsing this approach for appropriate subject areas would doubtless be the vanguard of methodological and epistemological innovation, (however, the probability of this ever happening is understandably slim).

10.4.6. Conclusion

Despite the conflict between research paradigm and structure of this study, applying a Grounded Theory approach, albeit in a compromised form, was surprisingly straightforward. One of the beneficial side-effects of purposive sampling was the ability to cut through the process of finding subjects and avoid wasting time. Even the learning style questionnaire and longitudinal study, though problematic, were beneficial in identifying areas for future study. The identification of emergent issues and creation of models for axial coding was simple to implement. Selective coding was also straightforward and informed the structure of data presentation. The use of mind maps, sketches and memos, (being a preferred method of working), was easy to apply.

Although positivism is criticised for its poor fit with creative endeavours, this study would have been very different without it - and not necessarily for the better. The positivist framework of PhD study requirements did provide the research with structure. Without it, there would have been no boundaries within which to work, the management of the process being difficult and no control against which to measure progress. Time, itself positivist, was also essential for the management of activities - an ensuing deadline essential for sharpening the mind.

10.5. Limitations of the study

Unforthcoming student subjects from some disciplines, (namely games design, animation and fashion) proved to be the greatest problematic, and meant the study had to rely upon a narrower range of disciplines from which to conduct student interviews.

Similarly, the lack of reliability of the student sample also created issues with the longitudinal study. (It should be acknowledged here that a far larger sample should have been accessed for both the learning style survey and longitudinal study – had this been not been a Grounded Theory-based study, this could have been pre-empted and addressed by the methodology).

The narrow range of intuitions from which the educator sample came may have had a limiting effect on the results. However, the depth of data acquired from each

individual was extremely useful in building the picture of sketch inhibition: the issue here was a trade-off between breadth of data via a sample from a larger number of institutions, or the high quality but limited sample used through a Grounded Theory approach to an indicative study – the latter still appearing preferential.

Issues of culture, educational philosophy, education policy, secondary and further education all emerged during the study – and although acknowledged, not investigated in greater depth. Caused by the methodological limitations discussed in 10.4 they were, nonetheless, frustrating.

10.6. Recommendations for further research

Although the intention was an exhaustive study, (naive as it may now seem), the reality of it proved very different. Its indicative nature provided a relatively small body of data from which a relatively limited set of conclusions were drawn. This is demonstrated in figure 40 below: within the area labelled 'exhaustive study' exist a number of areas identified during the research as potentially benefiting from further investigation. A comprehensive study is required, despite this potentially taking many years and involving multiple longitudinal studies of students, educators and industry influencers and a much larger set of participants from a broader sample of institutions.

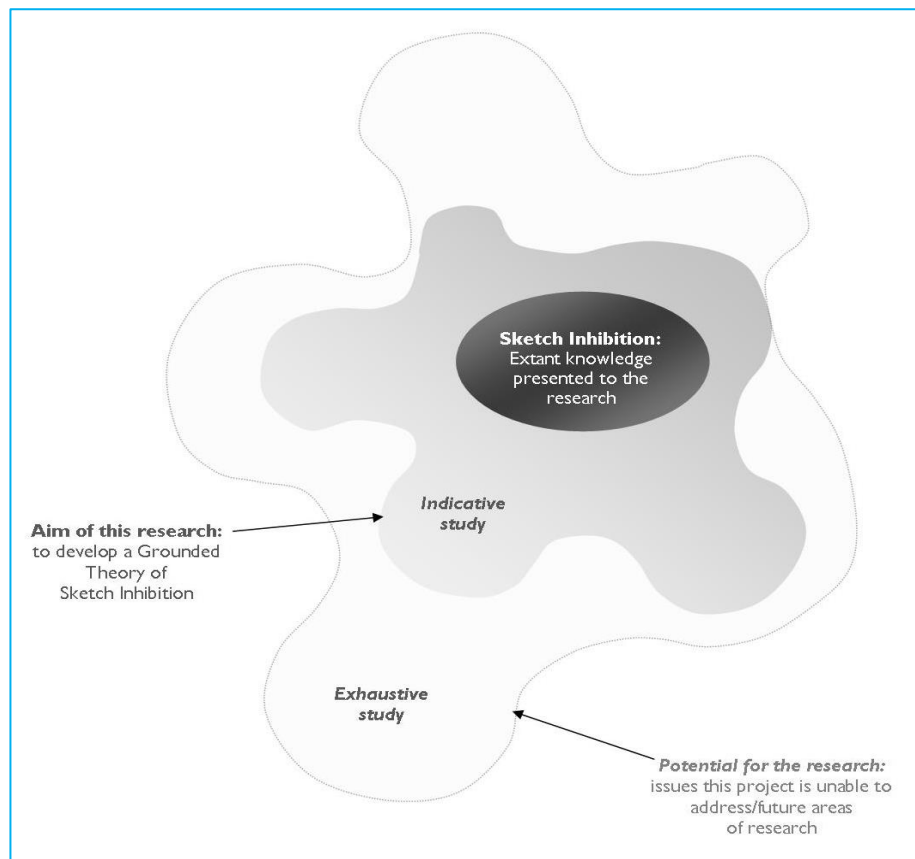


Figure 40: Potential for future research into sketch inhibition. Source: the author.

An examination of sketch inhibition using interpretive phenomenology would be valuable. This would develop the extant knowledge by considering the sufferer's perception of and response to sketching. Although considered a potential research approach during the early stages of the study, it still appears a valid means to build further knowledge.

A more thorough investigation of the relationship between learning style or learning preference and sketch activity and inhibition is needed, as is a study of the employment of inhibited and fluent graduates. The use of case studies could be applied to future subjects and institutions engaging in best practice. As already conceded, this has been effectively a pilot for a much larger and more comprehensive investigation into sketch inhibition and its management.

One of the most interesting aspects of this study was the relationship between cognition and sketch output during ideation. The physiology of brain function during this process was barely touched upon but offers an interesting avenue for research. A future study of brain function during ideation using imaging techniques, such as MRI, could add to the body of knowledge supporting the use of sketching during ideation, in addition to that of, among others, Kosslyn (1996) and Tversky (1999, 2002, 2003).

The effect of education policy upon the teaching of sketching and drawing requires extensive further investigation. This aspect was little considered but is one with huge effect upon design education. In addition, the nature of secondary and further education, its effects upon sketch inhibition being significant, require more exhaustive interrogation.

The cultural issues of sketch inhibition were of interest and despite there being little data, (and some contradiction), this posed another possibility for the research. The teaching and learning methods within other cultures would be valuable to consider, for both identifying causes of inhibition and examples of best practice. Without using a Grounded Theory approach to the study, such a potentially large and beneficial area of research would probably have been overlooked.

10.7. Proposals for future output

The first conference paper published by Thurlow & Ford (2017), *'Where have all the ideas gone? An anatomy of sketch inhibition among student designers,'* has been recently cited by Ranscombe et al. (2019) in, *'Designing with LEGO: exploring low fidelity visualization as a trigger for student behaviour change toward idea fluency.'* They refer to our findings regarding the misapprehension of digital tools as able to ideate. This is promising and suggests that research undertaken thus far is relevant and beneficial to the design education community. On this basis, a finalised and tested framework for the management of sketch inhibition would be timely.

A publication considering the relationship between Grounded Theory and traditional PhD study would also be timely. The lack of literature relating to this issue is curious and deserves further investigation. Although its consideration was an unintended objective of the research, its contribution to the discussion of methodology could be valuable. In addition to this, the identification of complexity theory was fortuitous. Consideration of its potential benefits to creative education in general would be a considerable undertaking, however, this could have significant ramifications for the future of such education.

10.8. Final words

As with most PhDs, the intention was to address a complex issue and produce a watertight solution within a neatly concluded thesis. In reality the process felt like one of stumbling through darkness in search of a little light. Early on it became clear that the enormity of the intended task would never be fully resolved, and that Grounded Theory was not a tidy means of conducting research: it is certainly not for the obsessive-compulsive. Despite this, discovering fascinating and unexpected data made it worthwhile and certainly prevented the typical flagging of interest towards the end of such a long project.

In terms of personal growth throughout the process, this has been an interesting journey. The intention at the outset was to prove oneself capable of completing a PhD – the process demonstrated capability beyond that expected and has even proven therapeutic. Having a preference for solitary working meant that the often complained-about isolation of such a study was actually welcomed. Where the time was found to produce four papers is now unclear, the entire process recalled as something of a blur. However, the mental stamina required to do so was found from somewhere and, thankfully, appears to have never left. In addition to this, writing those papers was in itself good practice, particularly in regard to the design and presentation of research and made the task of writing this thesis significantly less arduous. This entire process

has been one of enormous academic and personal growth and has opened many previously hidden intellectual doors.

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