

ANGLIA RUSKIN UNIVERSITY

FACULTY OF ARTS, HUMANITIES  
AND SOCIAL SCIENCES

THE HAND, THE MIND AND THE BOOK

LISA KIRKHAM

A thesis in partial fulfilment of the  
requirements of Anglia Ruskin University  
for the degree of Doctor of Philosophy

Submitted: October 2018

## Acknowledgements

I would like to extend my sincere thanks to all the people that have contributed to this thesis, directly and indirectly.

First, I wish to thank each of the designers who generously gave me their time. To Geoff Green, Dale Tomlinson, Phil Treble, Simon Loxley, Alistair Hall, David Jury, David Pearson, Berenice Howard-Smith, Susan Wightman, Michael Mitchell (1939–2017), Charlotte Tate and Neil de Cort: much of this work is about you.

I am also grateful to the people who responded to my emails when I sought information or explanations. These include Roberta Klatsky, Susan Lederman, Filipe Carreira da Silva, and Sebastian Lester. Added to this, I must especially thank Judith Bastin, who gave me access to the interview material she had gathered for her college dissertation 40 years ago.

Importantly, my thanks are due to my three supervisors, Will Hill, Paul Marris and Helen Marshall. In particular, I thank Will for restoring my belief in the value of my work whenever my confidence slipped, and Paul for his few, but always insightful words. Although Helen only became part of my supervisory team towards the end, her guidance, editorial sense and clear-thinking were invaluable.

I must thank my proof-readers, Michael Ayres, Sabina Akram, Callia Kirkham and India Toomey, who came to my aid at the eleventh hour. I am also indebted to Jane Boyer, who guided me through the finer points of the Anglia Ruskin Harvard referencing system, and kept me going when the task seemed overwhelming.

Many friends have supported me throughout this project. I owe a great deal to Debbie Pullinger, whose enthusiasm for my research topic was sustaining. Over the years, and over many coffees, she listened to my ideas and offered her viewpoints. Cameron Petrie gave up time to read part of a chapter in his area of expertise, in spite of his own workload. I am also grateful to Debra Ramsay, who kindly offered to read my thesis at its final stage, and gave me last-minute reassurance and apposite suggestions.

I have made several friends in the research room at Anglia Ruskin, and the many conversations have been a pleasure. Elizabeth Fraser deserves thanks for always responding in practical ways to a need. Outside of Anglia Ruskin, I wish to acknowledge my dearest friends – Michael Ayres, Sarah Brierley and Victoria Bardsley – for their constant and long-lasting friendship. In particular, I am especially thankful to Michael for his unfailing ability to offer different perspectives.

Lastly, I am grateful for my husband Peter, my daughter Callia (and her dog, Pocket!) and my son Jan, for all that they bring to my life. That gratitude also extends to my Mother and Father: thank you for introducing me to books (and printing presses!) from day one, and for the support that has gone unacknowledged for too many years.

ANGLIA RUSKIN UNIVERSITY

ABSTRACT

FACULTY OF ARTS, HUMANITIES  
AND SOCIAL SCIENCES

DOCTOR OF PHILOSOPHY

THE HAND, THE MIND AND THE BOOK

LISA KIRKHAM

October 2018

Digital technologies are unquestionably affecting all aspects of human life, with positive and negative implications for our present and future existence. More specifically, the effects on the publishing industry and changes to both the form and function of the book in all its realms have consequences for the ways we read and write, and disseminate and preserve all forms of knowledge and ideas. While these areas are the subject of current research, there is a lack of research into the impacts of digitisation on the process of design for the printed book. I argue that changes in this process are important for ongoing discussions concerning the future of the book, and in this thesis I investigate how technological change has affected the process of design through the ways we think, perceive and act.

The research combines empirical data collected through in-depth interviews with practising designers, analysed from the different, but interconnected theoretical perspectives of technological mediation, embodied cognition, affordance, haptic perception and material culture. While the focus is on design of the printed book, by drawing on cognitive science I extend existing research in other design fields by looking more closely at manual manipulation and sense of touch as part of our cognitive system. In addition, I review recent publishing theory and make a case for maintaining a view of the book as a container, and argue that physical attributes are key to future success.

The research findings indicate that working exclusively with digital technologies affects the degree to which we imagine, or mentally visualise, as part of the design process. I conclude that digitisation has affected the ways we think in relation to design, by encouraging us to off-load more mental effort to external objects. By offering less precision and ease, traditional methods appear to have particular benefits for our cognitive processes generally, and for the material qualities of the printed book.

**Key words:**

Book design, digital technology, materiality, touch, tactility, affordance, embodied cognition, publishing.

# Table of Contents

Introduction.....	1
-------------------	---

## Section I: Methodology and thesis context

Chapter 1: Research: method and methodology .....	17
1.1 Developing a research strategy .....	17
1.2 Data collection, organisation, analysis and synthesis .....	29
1.3 Concluding points .....	40
Chapter 2: Publishing past and present, and the role of book design .....	43
2.1 The book as a cultural object .....	43
2.2 Publishing: past, present and future visions.....	46
2.3 Book design: definitions and practice .....	58
2.4 Book design in the 21st century.....	62
2.5 Concluding points .....	65
Chapter 3: Design research and the value of physical processes .....	67
3.1 Digital technology and design .....	68
3.2 Sketching and typographic design .....	71
3.3 Current design process.....	80
3.4 Concluding points .....	89

## Section II: Theoretical framework and research data 91

Chapter 4: Understanding technology .....	93
4.1 Technology and philosophical enquiry .....	94
4.2 Defining technology.....	96
4.3 Technological mediation and a turn towards the material ...	105
4.4 Concluding points .....	116

Chapter 5: Affordance .....	117
5.1 The theory of affordance: background and developments...	118
5.2 Affordance: material properties, skill, knowledge and intention.....	121
5.3 Concluding points .....	140
Chapter 6: The mind – computational and embodied .....	143
6.1 The meaning of embodiment .....	144
6.2 Cognitive science and theories of mind .....	145
6.3 The embodied, situated mind, and design process.....	154
6.4 Concluding points .....	166
Chapter 7: Haptic senses, manual skill and design process .....	169
7.1 Sense, perception and cognition .....	169
7.2 Studies of the senses, haptic perception and design process .....	171
7.3 Haptic senses, digital technologies and book design .....	174
7.4 The hand: touch and manual dexterity .....	176
7.5 Concluding points .....	191
Chapter 8: Materiality, material culture and designing the printed book .	195
8.1 The problem of materiality .....	197
8.2 Material culture.....	205
8.3 The book as a physical object and design process .....	208
8.4 Concluding points .....	219
Thesis conclusions .....	221
References.....	231
List of diagrams .....	246
List of figures .....	246

Appendices (in separate volume)

A. Participation forms: consent and thesis information. ....	1
B. Interview transcripts.....	3
C. Excerpted pages of Judith Bastin's interview notes with designer Peter Guy and selected pages of final dissertation, <i>A look at British Book Design Today</i> (1977), Oxford Polytechnic. ....	171

## **Copyright declaration**

### **Copyright**

Attention is drawn to the fact that copyright of this thesis rests with:

- (i) Anglia Ruskin University for one year and thereafter with
- (ii) Lisa Kirkham.

This copy of the thesis has been supplied on the condition that anyone who consults it is bound by copyright.



## Introduction

No aspect of human life has been left untouched by digital technologies—the most revolutionary innovations since the Industrial Age (Runciman, 2018). It is therefore not surprising that such change has led to an accumulation of questions and criticisms concerning the evident and potential consequences of digital technology. Yet technological advances have always been accompanied by criticisms; the invention of the alphabet, for example, caused Plato to fear the impacts of writing on our capacity to remember and recollect (Plato, 1938: 274). However, the degree to which digital technologies are shaping our life positively and negatively makes research into their consequences necessary and urgent. While the effects are clearly wide-ranging, Bartscherer and Coover (2011) argue that the impact of the technology has been nowhere more significant than within the publishing industry. Other industries have no doubt been altered as significantly, but it is true that digitisation has profoundly altered the form, if not also the function of the book, affecting everything from the way a book is written and designed, to the way it is distributed and read. This is no trivial change: the book has existed in codex form (sheets of various materials, folded into pages and bound together) for nearly two millennia, and in printed form (rather than as manuscripts) for over five hundred years. The possibilities that have been opened up by digital texts, or electronic books (ebooks), have led to debates about every aspect of the book and the activity of publishing, even challenging what we consider a book to be. This has stimulated research projects that include studies of new ways of producing knowledge, the effects of screen reading on literacy, and the problems of preserving digital objects.<sup>1</sup> In all cases, the digital environment has highlighted the particular attributes of the physical book, drawing attention to the significance of material properties. As these properties are the preoccupations of book design, it is therefore timely and important to investigate the effects of technological change on design process, with respect to physical form.

<sup>1</sup> For more on research on the effects of electronic texts on literacy, see Mangen, A., and van der Weel, A., 2016. For the problems associated with digital preservation, see Chowdhury, 2010.

## Research topic and thesis questions

This thesis arose from a long-standing personal interest and professional involvement in book design, typography and printing, combined with a growing interest in the effects of digital technologies generally and, more specifically, for the process of design. This interest was strengthened by my work for a Masters degree in Typographic Design (2004–2006), when I became aware of differences in my thinking and way of working as I switched between digital and non-digital tools in the process of designing a typeface. In turn, this led me to think more about the value of manual skills and material objects, and question their effects on how and what we think. My interest in these areas coincided with the ‘revolution’ that was occurring in the book trade and the questions that were arising about the future of the book in the digital era. These changes engaged me as a book designer, a bibliophile and as a reader, but also as someone intellectually curious about our interactions and relationships with technological and non-technological objects. In short, *The Hand, the Mind and the Book* is an enquiry into the implications of working with digital technology for the process of book design, with an emphasis on sensory perception, manual action and material properties. It is motivated equally by personal and professional interests in typography, the material book and the digital world, and is naturally informed by my experience as a book-design practitioner.

It is important to note here that while the term ‘book’ (as a codex) can refer to any form of bound sheets (whether as a written manuscript, printed by different means, or a work created by an artist), for the purpose of this study I have chosen to concentrate solely on the design of a printed book—one that contains text and image, with a view to being read. It is this form that I refer to when I use the term ‘printed book’ throughout the thesis. I have largely limited my discussion to trade and academic publications, leaving aside other categories of books. This restriction also directed my choice of research participants. That said, elements of the research may have relevance for the making of any book that is intended to be a material object and the research could be extended to other types of books at a later stage. While my focus is limited to certain types of printed book, my investigation is interdisciplinary in its approach; it brings together theories from fields such as philosophy, psychology and material culture, as a basis from which to examine accounts of design

process gathered from interviews with design practitioners in order to identify and analyse change.

As I explain in Section II, there is good reason to argue that the tools and materials we use as book designers affect our design processes and design decisions, and therefore equally good reason to ask ‘how’ and ‘why’ this might be. Book-design literature and my personal experience make it clear that successful book design requires the ability to plan, combined with a sound knowledge of typography, aesthetic sensibility and creative thinking. Typically, a designer draws on these to find solutions to aesthetic and technical problems in a way that satisfies the needs of authors, publishers and readers. Typographer John Berry is certain that with typography at least, the principles don’t change, only the means (Berry, n.d.). Yet, it is surely possible that the means (the technological objects we use) affect our knowledge and understanding of those principles, or even change our abilities to serve them. They certainly change possibilities. In addition, the needs of authors, publishers and readers are likely to change in response to different circumstances. Robert Bringhurst is another typographer and writer who suggests that the tools are in some way neutral. In his seminal book *The Elements of Typographic Style*, Bringhurst declares that ‘The essential elements of style have more to do with the goals typographers set themselves than with the mutable eccentricities of their tools’ (Bringhurst, 2012: 10). His argument is that knowledgeable book designers will pursue their vision regardless of the tools; I suggest that the particular ‘eccentricities’ of the tools designers use co-determine the stylistic elements and design ideas. Bringhurst’s view of technology and tools has something in common with the view of type designer Fred Smeijers as expressed through his statement that ‘whatever happens, it happens around us, not within us’ (Smeijers, 1996: 186). Such opinions are open to challenge, and this thesis is a response to views of this kind. However, it is notoriously hard to identify changes in the ways we think and act in relation to the things we use—especially when that use has become second nature. Technology critic Michael Sacasas sums this up well, pointing out that in general we do not act with the sense or understanding of how a technology can ‘inculcate certain habits and engender certain assumptions’ (Sacasas, 2013: 40). A good example of the habits that book designers have developed through digital technologies is provided by the reflections of the 11, experienced design prac-

titioners I interviewed—most of whom have had experience of pre-digital technologies and working environments. They reveal that with digital tools, they have largely acquired the tendency to assess their work on screen rather than examining a physical copy, even though most of them acknowledge that there are benefits to looking at a printed version.

Back in 2004, design writer Peter Hall commented that things have changed since the days when designers were ‘schooled in the ‘rules’ of the craft and spoke an esoteric language known only to typesetters and printers’ (Hall, 2004: n.p.). He concludes that ‘Digital technology has forced us to rethink design practice’, thus indicating the extent to which digitisation has implications for all fields of design—including the niche field of text design. It surely also requires us to examine design process. Several decades ago, designer Hugh Williamson wrote of the need for ‘a continuing, methodical, and critical inquiry into book design, and into everything of technical, literary, aesthetic, and economic substance and value that we can observe in it’ (Williamson, 1983: xiv.) He also stated insightfully that ‘books will not keep their present form forever’ and that ‘book designers will be among those who evolve the method’ through which their messages are published (1983: 3). If designers are to participate actively in such evolution, they need the continued kind of inquiry to which Williamson refers.

My research aim, therefore, is to contribute to an understanding of book design in our digital age, by investigating the impacts of current technology on book designers and their processes, beginning from the position that the tools designers use are more than simply different means to the same ends. In essence, the central concern is whether digital technology has led to changes that extend beyond the methods, and if so, in what ways. With respect to technology, philosopher Lucas Introna appositely asks: does change lie ‘[...] in practices, in ways of thinking, or is it more fundamental?’ (Introna, 2011). Taking a lead from his approach, my overarching research question can be simply stated as follows: Have digital, ‘intangible’ technologies affected the process of book design through their impacts on the ways we think, perceive and act and, if so, what are the implications? In order to answer this, I formed a number of secondary questions which needed to be addressed, as I detail further on.

Given that the effects of digitisation on human life are complex, far-reaching and interwoven, it is hard to single out one aspect for study with respect to design process. However, given the nature of the activity and that the focus here is on the printed book, the implications of digital technology for the information we gain from our sensory systems and for our manual engagement with physical materials are logical areas for investigation. The changes brought about by digitisation for book-design activity can be summarised as changing a process that was mainly paper-based into one that is mainly computer-based, and that the move from paper to screen has brought with it a different set of skills. This naturally raises the question of whether particular skills have been lost in the transition and, if so, what are the consequences? In addition to changes in skill sets, the switch to screen-based technology has engendered changes to what we touch and how we use our hands to explore and manipulate objects. As digital objects are intangible, and some of our environments are now virtual, no sense is more affected by digitisation than touch—the sense that it has been described by Constance Classen (2005: 2) as our ‘hungriest sense’. Just as researchers are beginning to understand more about the value of a book’s tactile qualities, there is increasing interest in the value of traditional skills and physical processes—not just for design, but for cognition generally. Changes in skill sets and how we engage with physical objects have implications that extend well beyond the subject of design process, which increases the potential of this study to contribute peripherally to other fields of research.

If the purpose of the thesis is to uncover how the use of digital, ‘intangible’ technologies have affected the process of book design, it is conducted with other underlying aims: one is to further an understanding of the value of the use of traditional technologies and material engagement for the ways we think and act in relation to design process; another is to argue that in this digital age, material qualities are key to many debates concerning the book, and that the contribution that can be made by design with respect to these qualities should be more prominent in discussions about the book’s future; finally, in a wider context, furthering our appreciation of how physical interaction with the world affects the ways we think is of great importance as we become increasingly dependent on digital technology. To answer the research question and pursue these aims, I draw on theories outside of the design field to understand

current research on the ways we think and act in relation to the technologies and objects we use and encounter. From these perspectives I analyse the reflections and accounts of design practitioners (gathered through interviews) to identify and interpret change in design process, and draw conclusions on the effects of digitisation on that process, as set out below. At the early stages of research, my knowledge of the areas I was interested in was limited and I began with an open mind, but my direction was guided by the set of questions I had initially formulated. These are as follows:

1. How might the switch from working with pencil and paper to working exclusively with digital media affect how we conceive and develop ideas? (This is discussed throughout, but is specifically addressed in chapter three.)
2. How can we define technology and how does it mediate our actions and thoughts? What can theories from the philosophy of technology bring to bear on understanding the use of technologies for design process? (This is the focus of chapter four where I discuss technological philosophy.)
3. How do the physical qualities of objects (natural and manmade) affect our thoughts and actions? (I discuss our perception of objects in chapter five.)
4. How important is our sense of touch, tactile qualities and manual engagement for cognition, and has change in the levels and kinds of physical engagement influenced design process? (See chapters six and seven for my coverage of these issues.)
5. If interaction with material objects and processes is important, what do we understand by the terms materiality and material? Can we consider digital technologies to be dematerialising and, if digital objects are material, what are the qualitative differences? Do these differences affect the ways we think, and does this have implications for design process? (I bring the thesis to an end by unpicking the term materiality and present a case for digital objects to be understood as amaterial.)

These questions guided my literature search, which took me from cognitive science to design anthropology, and enabled me to pinpoint the areas and theories that were most useful. As becomes apparent throughout the thesis, as I pursued different theoretical positions, I began to find common ground—not least in terms of their shared tendencies towards a phenomenological outlook. The more I saw commonality, the more challenging it became to deal separately with each of my selected perspectives. However, as the research pro-

gressed, the thesis shape became clearer, as I outline further on. While I address the questions above in separate chapters as indicated, they all thread through the entire thesis. But, before I detail the overall structure, I first provide the research context.

### **Research context**

Having introduced the research topic and its underlying questions, I now provide a context for the research, to establish its place and value. The upheavals experienced within the publishing industry and the accompanying, vacillating predictions about the future for the material book have obvious implications for book designers and their processes, but evidence is accumulating to suggest that the change in technologies may affect us at a deeper level. In recent years we have witnessed a torrent of critical commentary on the effects of digital technologies on the ways we think and act. For example, Nicholas Carr (2015) discusses the changes to how pilots respond when using computerised systems that lack sensory feedback, and technology experts such as John Naughton warn of the dangers of concentrating data in the hands of a few (data monopolies) with consequences for how we acquire and assimilate information (2018). With the ubiquitous use of computer technologies, questions have rightly arisen with respect to their impacts on our cognitive systems. This can be extended further; the emergence of the concept of the Post Human—a being described by Nick Bostrom (2008) as one that has a capacity that exceeds what any person can currently attain—indicates how twenty-first century technology is even challenging the notion of what it means to be human. As the potential of artificial intelligence and robotics begins to be realised, research into technological risks to human existence has correspondingly grown. Although these areas lie outside of this investigation, they should be acknowledged as the climate in which the research is taking place.

As an aside, in the context of such an atmosphere of extraordinary possibilities offered by present and future technologies, it is worth noting that any discussion that challenges the benefits of such progress runs the risk of being classed as either technophobic, or nostalgic. I wish to point out that this thesis was not initiated by, or based on, a fear of technological change or sentimentality for a previous era; rather, I shared with my interviewees an uncritically enthusiastic response to the arrival of desktop publishing technology in the



1980s. Thirty years on, with appreciable experience in the use of digital tools and awareness of the many issues they raise, I find myself engaging more with a range of critical perspectives on technology, while simultaneously appreciating the positive advantages and possibilities that digitisation, or computer technology offers. I maintain that it is both possible and valuable to take an inquisitive stance towards digital technology without prejudice towards progress *per se*. At the same time, I argue that dismissing any suggestions of advantages offered by past technologies on the grounds that they are nostalgic, restricts the view by denying the existence of loss.

Computer scientist Roy Amara claimed that we typically overestimate the short-term effects of technologies, but underestimate the longer-term ones (Searls, 2012). Given the speed and uncertainties of digital advances, it is likely that both short and long-term consequences for human life are being underestimated. However, many effects are at the forefront of current research, including the changes in our physical interactions with things. Added to the examples cited earlier, questions have been asked about the impact of children's use of tablets on their learning, and evidence is accumulating to indicate that the extensive use of touch screens for pre-schoolers has disadvantages for the development of their fine motor skills (Ling-Yi Lin, Rong-Ju Cherng and Yung-Jung Chen. 2017). It is not a coincidence that the prevalence of terms such as 'embodiment', 'materiality' and 'tactility' has risen as we consider the impacts of digital objects and digital environments. This is certainly evident in the fields of art and design, but is also apparent in fields such as literature and book history. A symposium entitled 'The Children's Book as Material Object' held at Cambridge University in May 2017 was based on the premise that the growth in digital media has led to a corresponding turn in academic interest concerning the book as a material object. This 'material turn' in relation to the book is of particular relevance to this thesis, as will be seen in chapter eight.

Alongside the recent interest in physicality and materiality, we are also in the midst of a proliferation of research into the senses. In 2006, Sensory Studies emerged as a distinct scholarly field, indicating the increasing recognition of the importance of sensory perception, with notable attention on the sense of touch. In connection with new theories of cognition, studies of the senses are



leading to greater understanding of the relationship between our sensory organs and how we cognise. This goes hand-in-hand with research within the fields of engineering and human-computer interaction, where there is a focus on developing tactile feedback systems for digital technology. Investment in such technology is in itself acknowledgement that tactile sensations are crucial in a world dominated by technology that is often described as intangible.

Closer to this thesis, the use of physical processes such as letterpress for design education has been gaining more attention. Research projects of varying depth (e.g. the 6x6 Letterpress project, 2012) have taken place, showing the interest in handwork and the use of non-digital media for understanding design principles. In addition, an interest in pre-digital technologies and physical objects is also evident in a resurgence of fine printing for both artistic purposes and commercial ventures. These changes invite more investigation into engagement with material objects and the use of digital tools.

### **Digital technology and design process: what can be added**

In spite of the volume of writing and research directed at understanding the implications of digital technologies for an extensive range of issues, including the differences between print and screen reading (for example, Mangan, 2016, Baron, 2016), many effects remain uncertain, or not yet considered. This is certainly true with respect to potential changes in our neural structures, with possible longer-term effects on how we think and remember, read, write and even imagine. In other words, there is much we don't know in relation to the consequences of technological change. Technology expert Evgeny Morozov insists that there is a great need to investigate 'the shifts triggered by the proliferation of digital technologies [...] through a careful empirical and historical analysis...' (Morozov, 2013: 50.) The shifts he refers to are not simply concerned with the ways we publish or access information, but are shifts in the way we view our human society brought about by the capacity of technology to intervene in public life. Nonetheless, he points clearly to the importance of research that considers the past in studying the present. With a different emphasis, Judith Donath—a writer, designer and artist whose work explores the transformative effects of technology on the social world—also points to an area in need of research. In her view, in this digital era 'it is acutely important that we deepen our understanding of the meaning of physi-

cality [...]'. (Donath, 2011: 302). Given that physicality is a pressing issue in relation to books, this is certainly an area that warrants further investigation. To a degree, this is happening within the field of publishing, as new theories are emerging (which I cover in chapter two). Studies have also been carried out to investigate the effects of digital processes in some design fields, such as the use of computer-aided design systems for architecture, but there is a noticeable lack of research aimed specifically at book design, and more specifically at the design of text. Yet, there are evident overlaps. In response to studies of the use of letterpress technology for graphic design education, Pickstone and Rigley from Glasgow School of Art indicate a wish to see further interrogation into the 'forms of embodied knowledge neglected within digital practice' (Rigley, 2013: n.p). What kinds of knowledge (whether embodied, tacit or declarative) that is neglected through the use of digital technologies is hard to ascertain. But I see potential in exploring the impacts of digital technology on design process from the perspective of embodied cognition, tactile perception and materiality in order to, at least in part, pursue the challenge that Pickstone and Rigley identified.

Book design and typography, it appears, are often only indirectly or peripherally present in scholarly debates on the future of the book. While the material and sensory qualities of all forms of the codex are often discussed, especially in connection with preservation, the role and skills of a designer and their past, present and future contribution to material attributes are often neglected. Even in discussions involving design practitioners, the tendency is to focus on the contribution designers can make to the new, 're-imagined' forms of the book (eg, Drucker, 2013 n.p and Piper, 2015, n.p). In other words, traditional book-design knowledge and skill appears somewhat irrelevant. Designer Richard Hendel (2013: 1) showed some anticipation of this by suspecting that his own writing on book design might simply be an 'epitaph to a dead craft'.

Matthew Hayler, a lecturer in English Literature and digital cultures, recognises the need for conversations about technologies and objects and how we respond to them. He points out the 'often-ignored impacts of physical form' and asks 'What do the objects do – how are they meaningful and how do they make meaning?' (Hayler, 2016: 15). In the course of his research into readers' reactions to ebooks, he states that in the early days of digital-humanities re-

search, there was ‘little interest shown in the potential downsides of a shift in media from print to pixels’ (Hayler, 2011: 6). That interest has grown from little to substantial over the last seven years, as exemplified by the large-scale European project, *Evolution of Reading in the Age of Digitisation* (COST, 2016). And yet, among research projects concerned with the future of the book and the ways we read, design remains a relatively unconsidered factor.

It is incontestable that the impact of digital technologies on the codex and the publishing industry has been dramatic, fuelling interest in the past, present and future of the printed book and generating relevant research. This includes topics that range from the value and function of a printed book as both a cultural object and a transmitter and producer of knowledge, to the theoretical and practical problems of digitising medieval manuscripts. Changes and the instabilities they raise continue to preoccupy publishers, librarians and scholars from many fields in the light of the transformations we have witnessed to the way books are written, produced, distributed, read, remembered and archived. New disciplines, with indistinct boundaries and overlapping research interests have emerged as a result of the impacts on the way we communicate verbally and visually. The field of Digital Humanities is one example, covering research into new knowledge production and dissemination in a networked, multimedia environment. Cognitive scientists are studying the effects of screen-based reading on literacy and comprehension, and publishers attempt to predict, adapt to, and meet uncertain demand for changing products and services. Librarianship faces the complicated challenge of how best to preserve digital-born texts, as well as the issues that surround projects to digitise existing ones. This contributes to evidence that the impacts of digital technologies on the book are vast, yet the corresponding impacts on book design or, more particularly, on design processes are insufficiently integrated into these debates. Given the history of the book and its role in human intellectual and cultural development, it is not surprising that some aspects are relatively sidelined. Yet it is precisely because of these complex relationships with the book—which involves its material qualities—that book design and design process should feature more prominently in research.

The design of a book, then, is important. Book design is a function of design process, and design process cannot and should not be separated from the

properties and affordances (the possibilities for action) presented by the technological objects that we use. Type and typography expert Richard Southall points to this, stating that ‘The manufacturing process always imposes its own requirements on the designer’s work. These change as the nature of the process changes, and the process itself has to be understood in order to understand its demands’ (Southall, 2005: xiv). Similarly, at a conference entitled ‘The Resurrection of the Book’ (Birmingham, November 2013) contributors Sheena Calvert and Johanna Drucker both emphasised that it is impossible to separate the product of design from the process of its making. Drucker (2013) discussed the ‘conception of the work taking place within the how it is made’, clearly acknowledging that the design of a book cannot be separated from its means of production. Given this, I argue that there is more to learn about the relationship between the technological means and design process, and that there is a need for specific examination of the impact of technological change on book design. Design has more than surface value: typography affects the reading experience as well as the meaning of the text. Bibliographer Donald McKenzie (2002: 259) goes further, asserting ‘that every element of the physical book conveys meaning and thus contributes to our understanding of the work as a whole.’ The book also has a cultural value as a material object and this value is dependent on more than content. Sociology professor Filipe Carreira da Silva (2016) summarises the importance of designers, arguing that they are one of the many agents ‘directly involved with the production of a book. ... As such, traces of their work in the book can and should be analysed in their own right as they can powerfully frame or direct how readers interpret the work.’ Design is not a sideline issue and its process deserves attention.

### **Research approach and contribution**

After considering the different research methods that might be appropriate for my topic, I settled on a qualitative approach to data collection and analysis. This is covered in detail in chapter one. In brief, I chose to conduct a series of loosely-structured interviews with eleven carefully selected design practitioners, and one production manager. All my interviewees had experience of designing books for publishers, but with varying degrees of experience of pre-digital technologies. I chose people with experience of text design for academic or trade books through in-house employment or through freelance work, but with sufficient differences in their education or work practice to

widen the range of viewpoints. Five had some practical experience of letterpress printing, which offered useful insight through their ability to offer other technological comparisons. After gathering accounts and reflections on their current and past design processes, I analysed the material from different theoretical perspectives from non-design fields such as the philosophy of mind and technology, ecological psychology and material culture. The decision to draw from these disciplines was based on my judgement that to add to existing knowledge on the process of designing a physical book, my research question needed to be addressed from what is currently understood about how our thoughts, perceptions and actions are affected by our interactions with manmade and natural objects. This required extensive engagement with literature in different fields. I found that once I had developed an appreciable understanding of the areas I had initially identified, I made more connections and widened my reading to cover newer disciplines such as material culture, design anthropology and archaeology of the mind. The extent of the reading confirmed that this was a valuable approach and that my research topic had scope for future extension, by focusing specifically on just one of the areas I cover in this thesis.

Given the breadth of my literature review, it is helpful to emphasise the connections that I made between the theories I selected. The extent of these overlaps became more evident as the research developed, which for me confirmed the validity of my choice and helped me keep the bigger picture in mind. For instance, I began to see that embodied approaches to cognition are largely congruent with, and sometimes draw upon, theories of affordance, where both are concerned with our perceptual systems and external objects. Furthermore, both share ground with research in Sensory Studies, and in different ways, all can contribute to the work on material culture—the field that I cover at the end of the thesis. In essence, what links all of these disciplines is their focus on the relationships between our thought processes and our physical selves, or thought processes and the external world of objects and environments. Together these theories form the backbone of my research and I maintain that this approach provides a step forward in understanding design process in the light of digital technologies, and changes in those processes through effects on thinking, perceiving and acting which I conclude have occurred.

In his own writing on design at the end of the twentieth century, book designer Richard Hendel stated that designers ‘rarely discuss the process of how they design’ (Hendel, 1998: 1.) In this, he is not far from the mark—at least in terms of published, detailed accounts of the process of book design. This may be partly because text design can seem, on the surface, to be a simple act which in the digital age is often thought to be something ‘anyone can do’, as more than one of my interviewees suggest. Another reason may be that book typography can be seen as more technical than creative, and therefore of little interest. This is suggested by my interviewee, Dale Tomlinson, who comments ‘I think that these days book design is probably such a niche area people are just not interested in it’ and expresses his belief that ‘the core of good book design – and you can be creative in it – is still quite narrow. You have to follow certain rules.’ Hendel’s interviews with designers and the images of their work in progress show more than the application of rules; they show the degree of forethought, the scrutiny of all elements and the extent of creative ideas. They also serve as an important record of design practice at a particular time. By recording the accounts of practising designers at this point in design history, my research picks up where he left off, providing a story of change. The accounts I have collected offer reflections on the use of different technologies—a comparison which younger designers tend to lack. In this respect, one contribution of this thesis is the provision of a form of documentation of design process, as practiced by designers who have experienced a transition. The more significant contribution lies in my research outcome. I conclude that manual skills and physical interaction of the kind offered by pre-digital tools and media have implications for design process in terms of our mental visualisation, or conversely, that use of digital technology reduces our reliance on what could be termed thinking in our head. This is an area that I believe invites further investigation: the ways we think and imagine have implications beyond design process and the future of the book.

### **Thesis structure**

Although my research started with a broad sweep of the cognitive sciences and other fields, over time a natural order emerged. This led me to divide the thesis into two sections: the first has a more practical focus and provides the necessary background to the topic; the second is more theoretical and develops the discussion by drawing on several theoretical perspectives, which I cover in

the sequence that made best sense. However, as mentioned, these perspectives have overlaps, and my argument could have been presented in different ways.

The first section—‘Methodology and Thesis Context’—is divided into three chapters. In chapter one I cover my research methodology, outlining how I determined a valid way to address my research question. Here I discuss how I considered qualitative research theory in order to establish an effective way of collecting data, and explain the reasons behind my choices and how my methods evolved as the research proceeded. I considered the different approaches that could be taken and their relative limitations, but importantly, I took note from Heuristics—a methodology which supported my view that my individual perspective, my choice of literature and my data collection were intertwined. This process was invaluable for an understanding of the project as a whole, rather than as separate parts.

The second chapter provides the necessary background to book design and publishing. We know that publishing systems have been radically affected by digital technologies, and changes to the working practices of book designers cannot be fully understood if they are separated from the industry in which they operate. I therefore provide an overview of the publishing industry and the salient changes that it has experienced over the course of the last 30 years, and follow this with a discussion of recent theories. I then outline the practice of design prior to digital technologies to provide a reference point from which comparisons can be made. Here I discuss various definitions of book design and consider if these definitions remain relevant today.

Chapter three provides a review of relevant studies concerned with design process in the digital era. As there is insufficient research specifically focused on book design process, I have also referred to studies carried out in other design fields, such as architecture and graphic design. However, I predominantly draw on a particular piece of research carried out by Rachel Hewson in 1994, entitled *Marking and making: a characterisation of sketching for typographic design*. While technology has advanced considerably since this study, it is rare in that it focuses specifically on the role of traditional sketching for typographic design and consequently, this proved to be very useful.



This leads on to Section II: ‘Theoretical Framework and Data Analysis’. Here I examine my data from a more philosophical position. Over the course of five discrete, yet interconnected chapters, I give an account of my chosen theories and discuss how they each inform the investigation. I cover several complex areas relating to technology, cognition, sensory perception and material culture, in sufficient depth to provide insight into change in design process.

The section opens with a chapter on technology, where I discuss past and present hypotheses on our relationships with technological objects, and how they mediate. This chapter is followed by detailed discussions of: i) the concept of affordance (chapter five); ii) theories on embodied cognition (chapter six), iii) sensory perception and our sense of touch (chapter seven), and iv) the field of Material Culture (chapter eight). Affordance theory is concerned with the possibilities for action presented by material properties of objects. Embodied cognition is an umbrella term for recent ways of understanding how our thoughts, perceptions and actions are intertwined or co-dependent. The chapter on touch looks more specifically at manual activity and tactile perception, and the final chapter in this section connects the threads through a discussion of the term materiality and the importance of material properties.

The thesis ends with a summary of the research findings. The study indicates clearly that digital technologies have affected design processes in ways that are particular to, and result from, the digital environment and its properties. These effects are detailed throughout the chapters, but the most significant research finding is that the switch from manual to digital tools has affected the degree to which we mentally visualise concepts, or ‘think in our heads’. The more we work exclusively with digital tools, the more we are encouraged to off-load the work of our imagination to external objects, and the less we develop or exercise our capacity for mental visualisation and advance planning. I conclude that with respect to design, the notions of ‘thinking in our heads’ and ‘thinking through our hands’ should be considered in the light of thinking through the screen and its implications. This outcome warrants further, more specific investigation; it is not only relevant for the design community, it has potential to contribute to any field concerned with the use and impacts of digital tools for human life.



## **Chapter 1. Research design: method and methodology**

The aim of this thesis is to investigate the ways in which digital technologies have affected the process of book design and why this matters for the book. The research is situated in the context of the impacts of digitisation in general, but more specifically of their effects on the publishing system and the forms of the book. My research process has two strands. First, it involves the identification of theories that can offer relevant insight into how we think, perceive and act, and second, the collection of data designed to capture information on current and past design processes. The data is considered from the perspective provided by the theories I cover—many of which are emerging as relevant for a range of contemporary issues.

In this chapter I give an account of the research methodology, methods and procedures I followed for the thesis fieldwork, providing an overview of the stage-by-stage development of an effective strategy. I cover the thought and preparation behind the acquisition of data, the philosophical perspectives underpinning the research method, and the interview technique that I adopted and subsequently modified. I also give details of my research participants and describe the method I chose to analyse and synthesise the data that they provided.

### **1.1. Developing a research strategy**

I begin this section with how I considered the type of data that would best support the investigation. I continue with an overview of the literature that I consulted in search of a sound understanding of valid research techniques and the philosophical issues that underpin research choices. I follow this with a discussion of the key texts that I finally selected as a basis for the research design, and then outline how I used these to inform and refine my choices. I also include an account of design-specific research, showing how this supported the thesis as a whole.

## **Primary data**

My first step was to determine the kind of information I needed and the right method for acquiring it. In order to address my research questions, I wanted to focus on the personal experiences and reflections of designers, rather than on design outcomes, observations of practitioners at work, or controlled experiments. This was for several reasons. First, I wanted primarily to consider the impacts of technological change on the early stages of book-design process, and I decided that to compare the design qualities of finished artefacts created using different technologies would not elicit this kind of information. Second, although observations of practitioners at work could reveal something about current process, this in itself would not offer comparison with their previous practice. In addition, I considered that designers are less willing to be observed, but are open to discussing their process, and that lower levels of inhibition could lead to more authentic data. Third, to conduct practical, fair tests designed to compare processes using different technologies would have required a very different approach to the topic. Although I could see that this could be useful, it did not fit with my overall vision. However, I can see a place for this approach for further investigation of the specific points that emerge from this study.

In summary, I saw the fieldwork as a means to facilitate conversation to explore a set of ideas with practising designers and to generate rich and varied material for qualitative analysis. By engaging practitioners in a discussion of their particular experiences I aimed to explore existing ideas as well as to encourage different ways of thinking about the subject. In other words, I saw the research as having both deductive and inductive elements. This raised a methodological dilemma concerning the choice between grounded and non-grounded theories—a point I discuss further on.

## **Qualitative research literature and development of appropriate practice**

### *In search of a suitable model*

As I studied the literature on research methods and methodologies, it became apparent that the view of the nature and limits of knowledge held by a researcher is essential to the process of research design. This needed to be considered in order to answer the more concrete questions, such as: what kind of

data would be most valuable? What would be the most appropriate methods of gathering such data? How could this material be most usefully analysed? I had already concluded that qualitative research was the right approach, but there were other matters to be addressed. These are considered in turn over the course of the chapter.

With my interest in research methodology growing, I reviewed an extensive range of literature to gain a sufficient and enabling understanding of the issues of qualitative research; I also sought out practical examples of different processes. My intention was to identify a methodology that could give structure to, and guidance on ways of opening up communication with designers, that was both practicable and consistent with my perspectives.

This search exposed me to myriad methodologies and techniques for data collection, and their potential pitfalls. For example, structured interviews could be too limiting, and conversational-style ones could lack focus. It simultaneously revealed an inconsistency in the use of terminologies—particularly in the descriptions and ways of categorising epistemologies, theoretical perspectives and methodologies. For instance, the difference between the terms constructivism and constructionism could be confusing, and the links between epistemology and methods were sometimes differently described. While each writer did not present directly opposing views, it was clear that the topic was not being introduced with universal consistency. However, making sense of the field served to activate and strengthen my overall understanding of research.

In spite of the discrepancies I encountered, the different approaches set out by research experts had much in common—in particular, their origins. It was clear that the practice of qualitative research had emanated from the need to address the particular requirements of the social and human sciences in contrast with the requirements of natural science. New methods were sought (as alternatives to traditional, positivist methods) that could legitimately and usefully deal with qualities rather than quantities. While qualitative research of this kind is far from its infancy, there is less literature of this kind specifically addressing methods and methodologies for the fields of art and design. Along-

side *The Routledge Companion to Design Research* only published in 2015, what exists clusters around the growing interest in practice-based and practice-led enquiries—forms of research that Bruce Archer (1981, cited in Saikaly 2005) describes as ‘designerly mode[s] of inquiry’, pointing to tacit forms of knowledge and a distinction between art and science. Although my research was rooted in design process, I had elected not to undertake practice-led research, choosing instead to focus on the thoughts and experiences of practising book designers. Given this position, the research lent itself to typical social-science methods, but I wanted to look beyond these, to extend my understanding of ‘designerly ways of knowing’ (Cross, 2001) in case this could offer helpful insight. While this digression did not change my method, it led to a useful discovery; in following this line of enquiry, I became aware of different ways of categorising design-based research and in turn, these structures served the purpose of bringing clearer boundaries to my study. I now briefly outline this to show how it anchored my research process.

#### *Design-specific research methodologies*

Joyce Yee is unusual for being a designer with specific interests in design research. In her paper on ‘methodological innovation’, Yee (2010) states that in the main, doctoral theses in the field of typography have been of an historical or biographical nature. Research that stands outside of these categories, she points out, have tended to be scientific and carried out by researchers outside of the discipline. While this appears largely true, there are examples of design theses that do not fit into such categories, and I appraised the ones that ostensibly had affinity with my research. These included Anthony Calahan’s *Type Trends and Fashion* (2004; published 2008), Emily King’s *New faces* (1999; published 2005) and Yee’s own research, *Developing a practice-led framework to promote the practice and understanding of typography across different media*. Calahan looked at the trends in the use of typefaces in relation to theories of fashion and consumption; King, a design historian, explored technology and the practice of type design, showing some correspondence with my study if from an earlier time. Both used interviews as part of their research method and therefore acted as a guide. Yee’s thesis was different. It was aimed at developing a new model for teaching typography, but it stood out for its thorough explanation and justification of her chosen research methods. All

three researchers demonstrated a preference for a mixed-methods approach, relying on both quantitative and qualitative data as a means to further their investigation. Each was informative and shared some ground with my own work, yet there were sufficient differences in their outlooks and topics to sway me against mixing types of data. I could see a risk for a mixed-methods strategy to produce a volume of material that could become unmanageable, and dissolve focus. I wanted data that would provide a rich, personal account of practice, offering quality of information rather than volume.

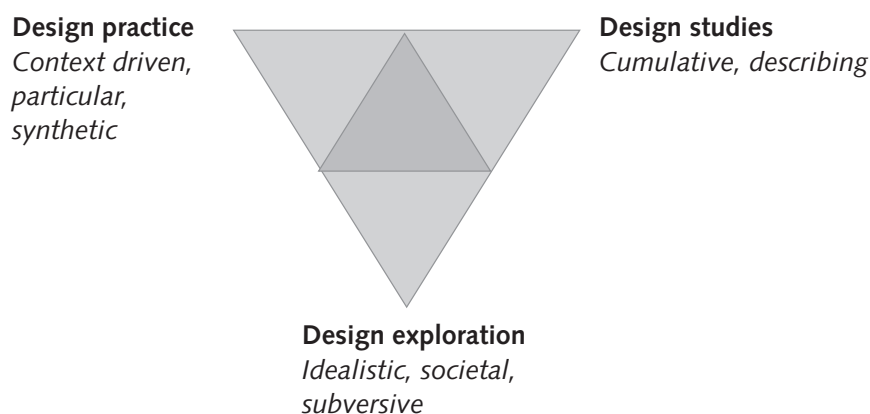
While the examples above were helpful, it was Yee's later research paper (2010) on innovative methodologies in design PhDs that proved most useful in an oblique way, leading me to consider the nature of my thesis as a whole. For her investigation, Yee drew on different established frameworks for categorising types of design research. Using the first of these—one originated by Herbert and later refined by Frayling—Yee presents three types of design research: 'research into practice', 'research through practice' and 'research for the purpose of practice' (Yee, 2010: 2). Taking 'research into practice' to be defined as that where 'design practice is the object of the study' I could see resonance with my own project. Yet, it was a framework developed by Cross that suggested greater correlation. Yee describes Cross' taxonomy as 'based on the focus of the investigation rather than on the method of research' and goes on to list his three categories: 'design epistemology', 'design praxiology' and 'design phenomenology' (Yee, 2010: 2). The first of these is defined as a study of 'designerly ways of knowing' (i.e., tacit kinds of knowledge) and is focused on people rather than objects. This broadly described my research, yet also seemed lacking. It was in Fallman's model that I found a more felicitous category for positioning my project and this provided a more solid base.

Fallman (2008) divides design research into three distinct, yet connected branches. Using a triangular model, he labels the three vertices as 'Design Practice', 'Design Exploration' and 'Design Studies', noting the qualities of each and illustrating how research can meander across the divisions (figure 1). While the categories share methods and techniques, he argues that the difference is rooted in their perspectives. Although this framework was created for interaction design, I could see how the model could apply to all subdivi-

sions of design research. Removing the elements specific to interaction design, I summarise each of his classifications as follows:

- i) **Design Practice:** where the researcher is actively involved in practice, yet with an exact research question in focus. That question is not necessarily identical to the design project, but the researcher is developing knowledge from deep, practical engagement.
- ii) **Design Exploration:** this is similar to design practice in that the researcher is involved with the creation of an artefact, but with the difference that the research question is not predetermined. By taking the form of ‘what if?’ the exploration has more in common with fine art. Design exploration, therefore, is more linked to testing an idea.
- iii) **Design Studies:** this type of research is driven by the desire to make a systematic enquiry, with the aim of contributing to knowledge. It is more analytical in nature and involves ‘taking part in and contributing to on-going discussions about design theory [...] and design philosophy’ (Fallman, 2008: 9). It is more likely to draw on theories and techniques from other disciplines and tends to look at studies of the ways designers work, think and act (Yee, 2010).

**Fallman's model of design research (simplified)**



*Figure 1*

Based on diagram in Fallman, D., 2008. The interaction design research triangle of design practice, design studies and design exploration. *Design issues*, vol 23(3). Cambridge, Mass: MIT.

Following Fallman's model, it was interesting to see how my research questions could be pursued in each of the three ways. Yet it was clear that my chosen direction, with an emphasis on theories drawn from a multitude of disciplines, positioned my research more naturally within Fallman's category of Design Studies. While many design theses are concerned with the visual appearance of an object, in my case an analysis of visual outcomes mostly laid outside the scope of my study. Although the final object is clearly important to the design process, my focus was on the experience of the designer and relationships with physical materials. Having a way of classifying my research gave a better shape to both my theoretical and empirical work and how they could mesh. Working from firmer ground, the customary literature on qualitative methods looked applicable, in spite of the fact that such methods were all developed by researchers from disciplines unconnected with design.

### **The Key texts**

From this position, I was convinced of the need for a technique with which I could attain rich and detailed material, and which could facilitate systematic, incisive and perceptive analysis. This needed to be underpinned by a methodology that was consistent with my epistemological viewpoint. The in-depth interview presented itself as a method that was well suited to gathering the kind of data required. Johnson (2001) states that this method is rarely used alone, raising the questions that have been put forward concerning its reliability by giving examples of anthropological studies that were later shown to be flawed. He expands this by indicating that such data is often combined with those generated by, for instance, the '...experience of the interviewer as a member or participant in what is being studied' and informal interviewing (Johnson, 2001: 104). I kept this in mind while finalising the research design and accepted that supplementary data might be needed once the interviews had been carried out.

My final choice of texts to determine the research practice was guided by the nature of my enquiry, with its roots in sense perception, engagement with the material world and practical experience. Crotty's book *The Foundations of Social Research* (1998) stood out as being the most intelligible guide, offering the clearest summary of the philosophical positions on which research is

dependent and a comprehensive grounding in theoretical perspectives. Here was a clear exposition of how philosophical theory and technique were bound together, with an organisational framework for developing a research system. In contrast with other writers, Crotty begins with methods and shows how these can be more specifically applied if they are related to a methodology and, ultimately, to an understanding of knowledge. In this way, the overall aim is kept at the centre. A benefit of this approach is that it reduces the inclination to decide a strategy with limited consideration of the wider context.

With the intention to conduct in-depth interviews already in mind and choosing to follow Crotty's approach to underpin this method, I broke down the research design process in line with his four distinct, yet interconnected parts. Through my main literature search covering sensory perception and embodied cognition, I had already exposed a phenomenological core to the project. A constructionist epistemological position was therefore consistent with my held beliefs about knowledge acquisition, as well as being consistent with the theoretical framework for the research questions. Constructionism, as defined by Crotty, rejects the notion of objective truth and favours the argument that 'truth, or meaning, comes into existence in and out of our engagement with the realities in our world' (Crotty, 1998: 8). It views the interplay between subject and object as contributing to meaning. Substituting the words 'subject' and 'object' for 'designer' and 'technology' leads to a useful description of my research topic.

With this view of knowledge, the 'theoretical perspective' that would support my chosen methodology was easy to identify. Again, observing Crotty's clear frame, it was logical that my particular perspective fell under the umbrella term of interpretivism—a category which included the philosophical structures provided by phenomenology and hermeneutics.

Phenomenology, as a study of our immediate experience of phenomena and being concerned with 'lived experience', was a natural foundation for my empirical research. However, I had doubts about the choice of methodologies to follow. Grounded Theory was attractive for being inductive rather than solely deductive, but in spite of more recent developments towards a more



constructionist position, this was not a perfect match for my research. Such methodology is based on the principle that data is gathered prior to the literature search, which was not compatible with my position. Yet my research was not a test of a specific hypothesis in a purely deductive manner. While I wanted to examine the validity of the theories I had assimilated from other disciplines, I simultaneously wanted to encourage the chance for discovery, to allow for new insights to emerge by interpreting the collected data in the light of theories on sensory perception and cognition. In other words, I anticipated that my data would have the potential for both inductive and deductive analysis and I needed a methodology that was sufficiently flexible to accommodate this.

‘Interpretative Phenomenological Analysis’ (IPA) provided an argument and technique borne out of an ‘inductive epistemology’. Primarily designed for research in psychology, Smith, Flowers and Larkin (2013) present a methodology based on the principles of phenomenology (concerned with lived experience), hermeneutics (a theory of interpretation) and idiography (with focus on the particular and the detail). While Crotty describes the divergencies between interactionism, phenomenology and hermeneutics in the context of determining a theoretical stance, Smith, Flowers and Larkin seek to bring together these perspectives to create a methodology for collecting and analysing data that is specifically concerned with personal experience. Using this philosophical trilogy, the authors provide a cogent guide on how to collect rich data for systematic analysis and I chose to use this as my primary guide.

The IPA method usually takes the form of semi-structured interviews, allowing participants to ‘speak freely and reflectively...’ and which sees both researcher and interviewee as ‘active participants’ (Smith, Flowers and Larkin, 2013: 56, 58). Fontana (2001: 165) also discusses an active style of interview, where interviewer and interviewee are both ‘active agents in the interview process’. This approach fits well within the framework of the post-modern influenced interview, which Fontana (2001: 163) describes as ‘...an interactional event based on reciprocal stocks of knowledge’. As a researcher with a practical background in book design, the idea of sharing knowledge and experience to create a dialogue with my participants fitted well with my overall aims. Yet in spite of IPA’s emphasis on creating rapport and allowing for flex-

ibility during an active interview, there was also emphasis on structuring questions carefully so as not to lead the respondent—a constraint that seemed at odds with an informal, flexible style that I was seeking and to a degree seemed incompatible with the idea of natural flow and ‘complementary reciprocity’ (Johnson, 2001: 109). The emphasis on non-leading questions is challenged by Kvale (2009), for whom the issue is not whether a question is leading, but where it leads to and whether this is useful, reliable knowledge. I judged that a situation that encouraged a natural engagement could offer more opportunity for an expansive, open dialogue and I was attracted to such a conversational approach—where the interview is less reserved and provides more chance of what Kvale (2009: 89) describes as ‘knowledge construction in and through an interpersonal relationship ...’.

Being inexperienced at conducting interviews, I had concerns about following a very unstructured, purely conversational interview style, with the possibility of veering too far from the topics I wanted to discuss. However, my reservations about relying on carefully worded questions were later confirmed by the experience gained from my pilot study, which proved to be invaluable and led me to make modifications. Those modifications were supported by the principles of Heuristic Research, a methodology described as ‘an organised and systematic form for investigating human experience’ (Moustakas, 1990: 9). These principles are discussed below.

### **The introduction of Heuristic Research**

Although I discuss the interviews themselves later in the chapter, it is useful to refer to my trial study at this point. This first study, based on the IPA method, revealed that the technique of using structured questions—even allowing for diversions during the course of the interview—made me take a restrained and less spontaneous role in the process. This created a situation that on reflection, felt deficient. In hindsight, adopting the role of listener rather than conversational partner added a degree of formality that was inappropriate, especially given that the respondent and I knew each other. Following up on the interview, my participant, Phil Treble, acknowledged that he would have found the experience different if it had possessed the quality of a conversation where both parties were contributing more naturally. Considering the nature

of my enquiry, and the nature of my participants who were all experienced in their field, I could not see that a more informal, conversational approach would reduce the quality of my data. In fact, it was likely to generate material that was richer, as a result of an increased potential to share knowledge as well as the possibility to introduce alternative viewpoints as a way of probing more deeply.

Heuristic Research introduced a methodology that gave credence to a more involved and personal way of interviewing, while also outlining interesting guidelines on data analysis that I could blend with those offered by IPA. At the centre of the heuristic approach is the idea of discovery—both in terms of the research topic and in terms of self-knowledge. Being open to discovery was a fundamental part of my work; furthermore I was aware of the background role that self-knowledge had played in fine-tuning my research process at each stage.

Moustakas does more than detail a technique for empirical work. He presents research as a holistic and immersive process, where the self-experience of the researcher is always present. In this way the data collection is a part of the entire process and has the characteristic of being intrinsic. Its appeal and relevance for my own study was partly rooted in the claim that its methods aim to find the meanings of experience and that knowledge ‘takes place within the individual through one’s sense perceptions, beliefs and judgements’ (Moustakas, 1990: 15). This connected with the fact that sensory perception was at the heart of the investigation. In a discussion of heuristic research, psychologist Dave Hiles (2002: n.p.) sees heuristic inquiry as a good way of ‘researching authentic accounts of human experience’. Douglass and Moustakas (1985: 42) similarly state that ‘[h]euristics is concerned with meanings, not measurements; .... experience, not behavior’. All of this had direct correspondence with the concerns of my research. In addition, much of Moustakas’ description of the research process—as one that draws on self-experience and allows for intuition to lead to further elucidation—articulated some of my own, intuitively driven investigative patterns. At this point, I developed a greater sense of the empirical work as seamlessly integral to the complete study, rather than as an individual part. This significantly altered my perspective.

My next step was to compare IPA and heuristics, to assess their relative merits and see how these approaches might be intertwined. Smith, Larkin and Flowers devote a chapter to the relationships between IPA and other phenomenologically based research methodologies, yet in spite of some similarities, do not make comparisons with Heuristics. Although heuristic research is based on the principles of phenomenological inquiry, with hints of common ground with IPA, Douglass and Moustakas (1985: 38) make a distinction between a phenomenological approach and a heuristic one. In their view, 'whereas phenomenology encourages a kind of detachment from the phenomenon being investigated, heuristics emphasizes connectedness and relationship.' In spite of this difference, overlaps in their aims were apparent. It was clear to me that while the heuristic approach was attractive and appropriate, there were aspects of IPA that were valuable as a guide for developing interview questions and systems for organising and analysing data. For heuristic research, the most natural method for collecting data is through the informal conversational interview that 'relies on a spontaneous generation of questions' (Moustakas, 1990: 47). IPA acknowledges that interviews, or 'conversations with purpose', are conversations with an artificial quality. There were benefits from adopting an entirely informal approach, yet there were also good reasons for imposing a degree of structure, to ensure that the topics I wanted to explore did not slip out of sight. To achieve this, my interviews had some resemblance to the form of a standardised open-ended interview, or, in IPA terms, a semi-structured interview, but this was modified by having questions that functioned more as guidelines. There was to be an emphasis on being less detached, on contributing my own thoughts and on giving space to a fresh, relevant idea, more in keeping with Moustakas' description of an interview process that allows for 'ideas, thoughts, feelings ... to unfold and be expressed naturally' (1990: 39). With my post-pilot interviews, I chose to allow topics to follow the flow of my respondent more naturally, enabling a more fluid dialogue. As IPA supports the idea of adapting methods, this was not inconsistent with either the principles of IPA or of heuristic research.

## **1.2. Data collection, organisation, analysis and synthesis**

If successful data collection requires organisation, flexibility and sensitivity, analysis surely requires similar qualities. In all accounts, good analysis de-

depends on a systematic application of ideas, imagination, and reflective, conceptual and critical thinking.

I used both IPA and Heuristic Research as models for examining and interpreting my data. It is here that the two approaches have much in common and one helped illuminate the other. In detailing the analytical process, Smith, Flowers and Larkin (2013: 80) decisively declare their intention to ‘provide a heuristic framework for analysis...’. Expanding on this, they also state their intention to provide a structure which is both flexible and clear.

In its coverage of the analytical process, IPA does not prescribe one definitive method. Instead, the authors acknowledge many suitable approaches, while pointing out that the distinguishing feature of IPA lies in its focus. Being essentially developed for psychological studies, this focus is on participants’ attempts at understanding their own experiences. This was entirely appropriate as my own attention was centred on my participants’ individual experiences and the sense that each made of such experience as examined in relation to my research themes.

In appraising the similarities and differences between the two approaches with respect to data analysis, the language common to both highlights how much is shared. Both refer to reflective engagement, creative insight, full immersion and the equal partnership between researcher and participant (termed by Moustakas as a co-researcher). Furthermore, being based on the principles of idiography, IPA starts with an in-depth examination of the particular before moving to the shared. This is entirely congruent with the heuristic system, which proposes first making an intensive and thorough study, or ‘depiction’ of an individual’s responses through a lengthy process of immersion in the data before making comparisons between participants.

Where there is divergence, it exists in the detail of the recommended procedure. Moustakas (1990: 49) places emphasis on the immersive stage, describing this as ‘timeless immersion’—undertaken until there is comprehensive understanding of the material. This is followed by a period of rest during which the material is contemplated, enabling the reviewer to return to the data with different perspectives and renewed energy. At this point, the material is

re-appraised. It is only now that note-making should begin. These notes are designed to pinpoint qualities and themes as they are identified and, after further review, are used to develop a complete depiction of the experience of phenomena being studied. If this depiction conforms with the material, the researcher may move on to the next participant, where the process is repeated until all depictions are completed.

The contrast with IPA is moderate, but worth noting. The IPA method describes its version of the immersive process—of reading and re-reading—as one which slows down the ‘habitual propensity for ‘quick and dirty’ reduction and synopsis’ (Smith, Flowers and Larkin, 2013: 82). The difference is that it suggests recording initial thoughts during this phase. Note-making at this stage is seen to serve two purposes: it can reduce any feeling of being overwhelmed by the data and it is useful to capture first impressions. This is followed by a more extensive note-making period described as being similar to ‘a free textual analysis’ (Smith, Flowers and Larkin, 2013: 83). Here, the researcher is encouraged to be open-minded and to note anything that sparks and interest. The aim is to compile comprehensive notes and commentary in the absence of rules.

Within the IPA framework, emergent themes are identified and often represented in graphic form before the next participant is studied. Once all cases have been studied, as with heuristic research, all notes are gathered together and shared patterns, universal qualities, convergences and divergences are identified and examined. For Moustakas, this stage involves re-entering a state of immersion in the material combined with periods of rest.

While the researcher is seen as central to the data-analysis process in both approaches, the heuristic method places greater stress on a tacit, intuitive awareness that the researcher develops through the practice of immersion and reflection. This is perfectly consistent with the essence of the heuristic approach, which puts a version of perspective, self-inquiry and self-dialogue at the heart of the investigative process (Moustakas, 1990). It was this aspect of the methodology that raised my self-awareness of my natural way of working and it made sense to adopt an intuitive procedure. However, the clear and detailed

guidelines set out by IPA offered more systematic support; once more, both models were used to instruct and plan my data analysis, as covered below.

### **i. Interview Preparation**

This section focuses on the concrete aspects of collecting the data. I give an overview of the research participants and on what basis they were selected. I follow this with an explanation of how I established interview questions in correspondence with the themes that emerged from my study of other disciplines. These themes are represented in diagrammatic form—a map which I initially constructed to give shape and boundaries to my investigation, but had the additional benefit of providing a point of reference at the beginning and end of each interview.

#### *Participants, or co-researchers*

Both IPA and Heuristics recommend a small number of participants for interviews, as both approaches are suited to a ‘detailed engagement with a small sample’ (Smith, Flowers and Larkin, 2013: 56). According to Smith, Flowers and Larkin, there has been a move towards smaller sample sizes in qualitative research, where quality is favoured over quantity. IPA advocates three to six interviewees on the basis that large amounts of data inhibit the time and reflection needed for successful analysis. Similarly, in discussing sample sizes, Silverman (2010) highlights the need for a balance between scope and detail. I was wary of collecting an overwhelming amount of data to analyse with sufficient depth, but wanted to include participants with a sufficient range of experiences. I initially selected ten practicing designers to interview. This was extended to include an additional designer and a production manager working for an independent publisher, to provide insight into how design is valued within the system.

#### *The selection*

With small sample sizes, participants have to be selected to ‘represent a perspective rather than a population’ (Smith, Flowers and Larkin, 2013: 49). My interest was in individual viewpoints on a number of themes, arising from personal experience of designing books. Any attempt to form general conclusions from such a data set would be specious, but I did not consider this to be



a problem within the confines of the research. The data would be scrutinised in terms of ‘theoretical transferability rather than empirical generalizability’ (Smith, Flowers and Larkin, 2013: 51).

IPA generally works with respondents that have a uniformity, where the number of variables are limited so that the differences and commonalities revealed by the data can be examined in greater detail. I set out to gather participants that had some homogeneity in that they all needed to have an appreciable experience of book design, yet I also looked for a degree of variation in their background and work experience. A reasonable span of ages was also thought to be of value.

My personal work history and education made it relatively easy to identify and approach suitable participants and I selected ones that I considered could provide comparable and yet contrasting data. Some I already knew, others I knew only by reputation or from a brief encounter. I contacted each potential participant either in person or via email, giving each a brief description of the research topic with an explanation of what their participation would involve. Only one person failed to respond. With this exception, all participants were happy to be included, and expressed their interest in the project.

I finally interviewed eleven practicing designers who worked exclusively or largely in book design. Three had considerable experience of letterpress printing, two only had work experience using digital technology, and one had a background in dentistry and described himself as self-educated in design. Eight designers were male and three female, with an age-range spanning over 35 years (from mid-twenties to mid-seventies). As a later addition, I interviewed a production manager, who also had experience in editing. Not all participants worked exclusively with books, but all worked with print and typography. For half of the participants, working with pre-digital technologies represented a significant part of their careers. For others, digital technologies had played a much more significant role during their education and subsequent work experience. I deliberately selected designers with different backgrounds to provide a greater chance of drawing out different viewpoints.



My youngest participant had used letterpress at college but had no experience of the phototypesetting technologies that immediately preceded digital.

The names of each participant and brief biographical details are as follows:

### **Participating designers: Information at time of interview**

---

#### **Phil Treble (pilot study)**

Freelance graphic designer and letterpress printer.

Higher education: Graphic design and communication.

Employment history includes book design for trade books at Penguin Books.

#### **Geoff Green**

Freelance typographer and book designer, and erstwhile publisher.

Higher education: Book design and typography.

Employment history includes design for trade and academic books at Cambridge University Press.

#### **Alistair Hall**

Graphic designer for print. Founder of design studio We Made This.

Higher education: Art History and English; Graphic Communication.

Has little experience of working with pre-digital technologies.

#### **David Jury**

Book designer, typographer, letterpress printer, design writer and MA course leader at Colchester School of Art.

Higher education: Graphic Design.

#### **Charlotte Tate.**

Currently employed as book designer of trade books at The Folio Society.

Higher education: Graphic Communication; Book design. Has little experience of working with digital technologies outside of university.

#### **Dale Tomlinson.**

Freelance book designer.

Higher education: Graphic Design.

Employment history includes book design for publishers of both trade and academic books.

**Michael Mitchell.<sup>1</sup>**

Founder of Libanus Press. Typographer, book designer.

Higher education: Michael trained and worked in dentistry, but learned letterpress printing in the 1970s from which he established Libanus Press.

**Susan Wightman.**

Typographer, book designer. Michael Mitchell's partner at Libanus Press.

Higher education: Illustration.

**Berenice Howard-Smith.**

Currently employed as a book designer at Cambridge University Press.

Higher education: Typographic Design; English Literature; Graphic Communication; Commercial Art.

Employment history includes magazine publishing and Pearson.

**David Pearson.**

Freelance book designer, specifically working within trade publishing.

Works mainly in trade publishing.

Higher education: Graphic Design

Employment history includes Penguin Books.

**Simon Loxley**

Freelance designer, lecturer and writer on typography and design history.

Higher education: Graphic Design.

**Neil de Cort.**

Currently employed as production manager at Polity Press, Cambridge.

Higher education: English Literature.

Employment history includes editorial work at Miles Kelly Publishers and production management at Cambridge University Press.

---

Interview length: 60–90 minutes.

<sup>1</sup> Michael Mitchell sadly died in 2017.

### *The interview themes*

The interviews were initially planned under the direction provided by IPA. I began with carefully phrased questions intended to elicit viewpoints on selected themes. These questions were intentionally expansive to encourage protracted and thoughtful responses. Some were designed to induce descriptive answers, while others were more evaluative ones. Although there was an attempt to give some conformity between interviews, the questions were modified to be applicable to the particular circumstances of each participant. Referring back to my earlier point, with each successive interview I increasingly reduced the reliance on the uniformity of the questions. This was partly because my familiarity with the topics grew and partly in line with my shift towards greater informality and personal input. Put simply, the degree of standardisation decreased as the research progressed. However, although the themes on which the questions, or conversation topics were based became more defined, they remained more constant. These original themes and the links between them are shown overleaf.

Using a diagram to specify and order themes was helpful for keeping questions relevant (see figure 2 overleaf). It had the additional purpose of providing a reference to revisit at the end of each interview, to help assess what was covered and what gaps might be missing. In some cases, I had further email contact with my participants as new thoughts emerged after the interview. Half-way through the interview stage, the idea of tactile memory and how we might recall tactile sensations occurred to me and I added this to the areas to investigate. However, after pursuing the idea in a meeting with the psychologist, Professor Spike Lee, I realised that this was an unexplored area that would require substantial and dedicated investigation in itself. I noted it as an interesting area for future research.

### Areas of enquiry: Digital technology, haptic perception and design processes

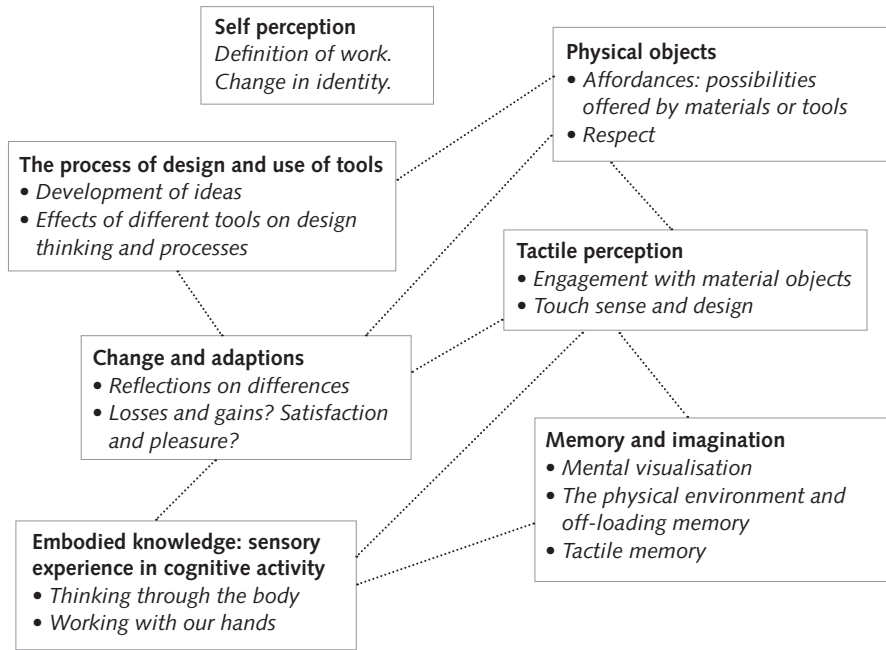


Figure 2: Areas of enquiry

## ii. Interviews in practice

This part of the chapter is concerned with the interviews themselves. The purpose is to give an overview of the procedures and practical matters that surrounded the data collection. It ends with a short reflection.

As my study of literature was extensive, my fieldwork became delayed. My interview questions were under constant review and subject to change as I formed new ideas based on the information I continued to uncover. Rubin and Rubin (1995) describe the planning stages of data collection as needing to be adequate to meet expectations, but that at some point a leap of faith is required. Once I had accepted that the process is rarely perfect and inevitably involves adjustments along the way, I found it easier to begin interviewing. The majority of interviews took place within one year.

### *Procedures*

Once the participants I approached had agreed in principle to take part, I established a procedure to follow prior to the interview taking place in order to ensure good, ethical conduct. I forwarded an information sheet to each par-

ticipant, outlining the research topic and explaining how I intended to use the material. The information included the conditions of use, with a guarantee that their comments would be used for the sole purpose of the research and that they would be advised in advance of any work published that might refer to the participant by name. It also stated that the interview would be recorded.

After any questions had been raised and answered, each interviewee was then presented with a consent form to sign. This gave me permission for their comments to be used in accordance with the conditions set out in the information sheet. Importantly, it also confirmed their right to withdraw from the research at any time. (See Appendix A.)

It was imperative that no interviewee was unnecessarily inconvenienced and that any expenses incurred were reimbursed. Additionally, I placed importance on the interviews taking place where the respondent would feel most at ease. For these reasons, the interviews took place in a location chosen by each participant. In some cases this was their home or place of work; others chose a convenient public space. One person travelled to meet me. On one occasion, the location turned out to be problematic, due to intermittent but significant background noise. On the same occasion, the recording failed, losing 20 minutes of useful data. Although the participant offered to repeat the interview, I chose not to follow this up as I had already taken time away from her work.

My first participant—who also acted as my pilot study—was the freelance designer and letterpress printer, Phil Treble. We talked in his print studio. He chose to stand during the interview, which at first added a degree of formality and lack of ease, but had the benefit of enabling him to move around and show me physical examples of his work. This was useful, not only for supporting some of the points he was making, but through his movements he revealed his appreciation of materials and physical processes. Geoff Green, Susan Wightman and Michael Mitchell also chose to be interviewed in their work environments. Geoff spontaneously showed me examples as he was talking which made the process congenial and interactive. In hindsight, I might have gained further insight if I had conducted all the interviews in my participants' place of work.

Each interview had different qualities and as my experience grew, I discovered more effective ways of working. Where the respondent had a great deal to contribute, I noted points of specific interest that I could refer back to at an appropriate time without interrupting the flow of conversation. At the end of each interview I added notes to my list of questions, suggesting areas that I might include or bring into the discussion in the next interview. It was a process that evolved as I gained confidence in the value of the material I was amassing.

### *The next stage*

Reflecting on the research after completing the theoretical framework, I could see how the fieldwork could have been prepared differently to produce more focused responses. Had I known sooner which of the topics were to be the most intriguing and useful, I could have generated more penetrating questions designed to capture more incisive data. However, the existing data contain extensive and valuable information and provide a sufficiently solid, although not exhaustive, contribution. In combination with the theoretical framework, the data also point to future lines of enquiry, as I had hoped.

### **iii. Data analysis**

The heuristic method of analysis emphasises time devoted to immersion in the collated data. I spent time listening repeatedly to the interviews before I began transcribing them, but it was during the lengthy transcription process that I developed a deeper sense of the material overall. By painstakingly converting the recordings into typescripts, I gained sound familiarity with what the participants were saying—not just individually, but comparatively. At this stage, themes and patterns surfaced more clearly.

Once all the interviews were transcribed, I chose to use Scrivener to organise the collected material and make a system for manual coding. I made a deliberate decision to avoid using an automated method of analysis such as that provided by NVivo or similar programs. This choice seemed suitable for the amount and type of data I had gathered and to maintain my immersion. NVivo would have been more appropriate had I gathered a larger data set.

I placed each interview transcription in its own folder, therefore separating the information by participant. At this point, I was already familiar with the contents and had a good grasp of which themes were of interest. My next step was to create a set of categories based on my theoretical perspectives, adding in additional categories to highlight other issues that were clearly emerging. I then colour-coded each of these categories as follows:

[Sense of identity / changes in roles]  
[Book design definition]  
[Change in publishing system]  
[Design process / thinking]  
[Material culture / material engagement]  
[Cognition through embodied experience / manual skills /  
sensory perception]  
[Tactile sense]  
[Technological impact – affordance]  
[Mental visualisation]  
[Knowledge and skill]  
[Constraints]  
[Attention]  
[Automation]  
[Control]  
[Respect / value]

It became apparent that some of these categories, while interesting, were more peripheral to the research questions. I therefore classed these as of secondary value and put them aside.

At this stage, I went through each interview placing my codes as tags where appropriate, thereby highlighting the statements in each interview which connected with the topics I wanted to discuss. This increased my familiarity further as I went back and forth several times, adjusting and refining. With the transcripts coded in this way, it was easy to group the data thematically. I created new folders (in Scrivener) to represent each topic. This enabled me to

sift through the coded transcriptions using the search facility and re-organise the material in a way that would be appropriate for integrating into my writing. Again, by slicing and rearranging the data, and reading it in this way, I could see clearly the commonalities and divergencies between the designers' reflections. Furthermore, at each stage I became more familiar with the content and aware of how the material connected with my theoretical perspectives. It was useful to switch between reading the material organised thematically and the designer's individual transcripts to check my interpretation, which I did many times. By this point I was carrying out a more formal process of note-making, using the document notes facility in Scrivener. This fed naturally into my chapters.

### **Additional material**

Towards the end of my interviews, I made contact with a typographic designer, Judith Bastin, who had trained me at the start of my career. For her undergraduate dissertation *British Book Design Today* (1977), she had interviewed three renowned book designers—Gerald Cinamon, Elwyn Blacker and Peter Guy (Bastin 1997). She was willing to give me access to her handwritten notes of the interviews and her final dissertation, which I have also drawn on. Added to this, at the St Bride Library I found archival material of interviews carried out with members of the Wynkyn de Worde Society—an organisation for people 'dedicated to excellence in all aspects of printing and the various stages of its creation, production, and dissemination' (Wynkyn de Word Society, n.d).

### **1.3. Concluding points**

The purpose of my research is to capture how the use of digital technologies is affecting the process of book design, with a view to understanding the value of traditional processes and the future of book publishing. The overall research-design strategy was two-fold: the assimilation of appropriate and interconnected theoretical perspectives and the collection of data from interviews with practising designers. For the data collection, I synthesised two qualitative research methodologies with a phenomenological slant. These were selected for their suitability for gathering personal accounts of individ-



ual experiences—in this case, accounts of design process using different technologies. The first of these is known as Interpretative Phenomenological Analysis, an approach which combines theories of hermeneutics, idiography and phenomenology to support its recommended practice of in-depth, semi-structured interviews for investigating experience. The second approach, Heuristic Research, complemented the IPA methods, without sharing a strictly phenomenological base. IPA methods were initially adopted, but the heuristic approach added subtle and valuable differences to the interview technique and was consonant with my research position overall. For analysing data, both approaches have a common essence and I absorbed elements from each.

#### *A final note*

Having surveyed much literature on research design, two points are worth a final comment. Firstly, as my study was rooted in the field of design, I found that using a framework for categorising an approach to a problem proved helpful in terms of orienting my work in an area that has less of an established research history. Secondly, while there are many viewpoints on—and systems for—carrying out qualitative research, most are concerned purely with empirical work. One exception is Heuristic Research, which presents a methodology that encompasses all stages of the research project, giving a holistic view and framework for an entire study. This was invaluable. The heuristic process of deliberate, self-conscious and sub-conscious immersion in a subject that fully engages personal curiosity describes the underlying approach to research that has characterised this project as a whole. The discovery of heuristic research methodology gave credence to my initial intuitive approach and I applied this more knowingly and systematically throughout the process.



## **Chapter 2. Publishing past and present, and the role of book design**

One aim of this research into the effects of digital technologies on book-design process, is to add to an understanding of any value of pre-digital technologies for design processes. As the study is concerned specifically with book design, and is taking place in the context of the current book trade, it is necessary to provide relevant background to the book and the publishing industry, as well as to outline past and present practices of book design. To this end, I briefly cover our relationship with the book to establish its significance as a cultural and technological artefact. I then trace the development of the publishing industry from its origins in the 15th century to its current state, and discuss recent publishing theories to establish the current role of book design. This leads me to consider the different aspects of book design, what design contributes to the book, its reader and its publisher, and its relevance for today.

### **2.1. The book as a cultural object**

The invention of writing created a shift from an oral culture to a written one, with profound implications for human development. The first forms of written communication eventually led to the invention of the codex—sheets of various materials, written on and decorated by hand, and bound together in a form that was a precursor to the printed book. The process of producing books through printing rather than by copying by hand was made possible by the invention of moveable type by Johannes Gutenberg in the middle of the fifteenth century—a technology that is considered to be one of the most significant for human development. As literary scholar and neuroscientist Iain McGilchrist (2012) reminds us, from the early manuscript codices to our most recent digitally formatted versions, the book transforms life and, in turn, we transform it. This mutually transformative relationship has become especially evident in recent years, as new technologies have given rise to substantial changes to the book, with consequences for the ways we write, read, share

and store knowledge, and generally comprehend the physical and social world. The book, in all its forms, is more than a useful means of transmitting and preserving knowledge; it is a cultural artefact that occupies a unique place in our history and allows us access to our past. It is therefore important that we investigate the effects of recent technological change on all aspects of the form and function of the book. This includes its design, not least because it is a link—if an under-appreciated one—between the two.

### **Transitions**

The book has evolved over the centuries, shaped by developments in materials and means of production, methods of distribution and social change. For example, the invention of offset-lithography towards the end of the nineteenth century changed the way images and colour could be reproduced, with implications for book design and content. While the technologies of production have advanced and the appearance of the book has become more varied, its form has remained recognisable throughout. It is only in recent years that a book has appeared as anything other than a physical object, consequently making us rethink the qualities of tangibility, durability and fixity that we have so long associated with it. Yet, these qualities are relative. When printing on paper replaced hand-copying on parchment, the monk Trimethius expressed concern that paper could be expected to last a mere 200 years—considerably less than the materials in use at the time (Norman, n.d.). In spite of opposition and challenges to its existence, the printed book has flourished since its advent more than five hundred years ago. In response to the possibility of mass production made possible by moveable type, critics complained of an overload of information through the increase in the number and variety of texts—not dissimilar to concerns that are associated with today's digital media. Any suggested negatives were far outweighed by the substantial benefits and the printed book thrived, but predictions that the book would become redundant are not just a recent phenomenon. In 1894 the French writer and publisher Octave Uzanne (1894) wrongly anticipated the end of books due to the new technologies for 'registering sound', but it is the recent possibilities provided by digital technology and electronic reading devices that have provided the greatest threat to the printed form. At the beginning of the 21st century, many publishers and scholars were convinced that the future for the physical book

was, at best, fragile. Even in 2010, Nicholas Negroponte predicted the print book would be dead in five years (Mims, 2010). Although publishers rushed to invest in new, untested electronic forms during a time of uncertainty, these early predictions were incorrect. Instead, the printed book has persisted and, in fact, recent figures show that the sales of physical books ‘continue to outpace digital’ (Campbell, 2018). Notably, speaking in 2017, Steve Bohne from Nielsen Book Research UK stated that the preceding years had shown ‘a return to favouring print’ (Cain, 2017). This is not to say that the printed book has been unchallenged or unchanged, but it appears that such challenge has steered attention towards the particular attributes of printed books, highlighting the reasons why the print form persists. While the dominance of print has reduced over the last century, it is evident that our attachment to print books goes beyond their purpose as transmitters of information, or ‘content providers’. It is becoming increasingly clear that the tangible and aesthetic qualities that are present in print books—and currently absent in ebooks—provide functions and resonances that are more valued than once anticipated. Paula Coccozza (2017: n.p.) pinpoints the qualities that an ebook lacks in comparison with its older form:

Here are some things that you can’t do with a Kindle. You can’t turn down a corner, tuck a flap in a chapter, crack a spine [...] or flick the pages to see how far you have come and how far you have to go. You can’t remember something potent and find it again with reference to where it appeared on a right- or left-hand page. You often can’t remember much at all. You can’t tell whether the end is really the end, or whether the end equals 93% followed by 7% of index and/or questions for book clubs. You can’t pass it on to a friend or post it through your neighbour’s door.

These material qualities are the domain of book designers, whose task is to focus on the physical characteristics of any publication. The possibility of electronic forms of a text—existing as intangible, digital code made visible via the medium of a screen—challenges us to think more consciously about the material qualities of books and the processes by which they are determined. By extension, this validates investigations into the contribution made

by design and the changes in design process brought about by technological advance. The aesthetic and sensory attributes of a book, provided by its material properties and design, are by no means trivial, and I argue that a book's value—real and perceived—as well as the meaning of any text, cannot be separated from them. As I discuss further on, this position confronts recent publishing theory that presents a vision of publishing as a machine for content (Bhaskar, 2013). Our connections with books are complex and profound; religious volumes can assume great importance in a home and children's books can engender emotions long past childhood. Books can be treasured for both their aesthetic beauty and the knowledge they carry (Finkelstein and McCleery, 2005: 8). In the digital age, the relationship between the two is being severed. Digitisation has encouraged us to view the book as a provider of content. Yet to reduce a book to mere content, independent of its form, is similar to thinking of food as simply a provider of nutrients, thereby denying its other roles in our lives.

## **2.2 Publishing: past, present and future visions**

Just as we cannot examine the process of book design without knowledge of the book's history and of the technological developments that have shaped it, equally we cannot ignore the organisations that have been responsible for their production. The history of publishing is extensively covered by different scholars and a comprehensive account is not needed here. However, a brief account of its evolution is required in order to give context to the role of the designer and to support my argument that a book is more than a transmitter of information, and that the processes of its design matter.

Without question, digitisation has radically changed every part of the publishing system, from the way books are written, edited and designed, to the ways they are distributed, preserved and consumed. This has invited new ways of thinking about the activity of publishing and what a book can be. Against this background, I discuss recent theoretical research and the absence of sufficient attention to the value to the book industry offered by material qualities and design.

### **From the printing office to the publishing house**

Although a book trade existed long before the advent of printing, the work of scribes (what we might think of as akin to design and typesetting) was separate from the activity of publishing and selling. Through his invention of moveable type in the middle of the fifteenth century, the goldsmith Johannes Gutenberg made it possible to produce books from printed sheets. This radically changed the nature of book commerce. The significant increase in the speed at which books could be produced and reproduced affected both the quantity and variety that could be supplied. This was met with a corresponding growth in demand, as a result of the wider distribution of knowledge and the impacts on literacy, creating a thriving market. Eventually, this led to the rise of what we consider to be the modern publishing industry.

If we follow Feather's (2006: 1) definition of publishing as 'the commercial activity of putting books into the public domain' then it follows that in the early days of the 'printing office', the printer could also be described as publisher and in some cases, as bookseller. The roles of the fifteenth-century printer included the activities that we know as typography and typesetting, as there was little differentiation between the functions of typefounder, printer, publisher, editor and bookseller (Steinberg, 1996). Editing, printing, publishing and bookselling were closely enmeshed throughout the sixteenth century too (Feather, 2006). Printers could select what to print, bore the financial risk of production, and made their stock available for sale through different means. While there are exceptions to the rule, The Aldine Press established by the Italian printer Aldus Manutius in 1494 provides a good example of how all these functions were combined. Notably, Manutius not only thought of content, he also clearly thought of design and form. He had the vision to produce pocket-sized books to improve portability and increase demand, and hired his own typesetter, Francesco Griffo, to produce his type—a collaboration which gave rise to the first italic font, extending typographic options and indicating his design sensibility (Lowry, 1979).

The book trade expanded and evolved in accordance with advances in technology, social change and commercial ambition. The various histories of publishing detail the events that eventually led to the complete separation of

printing, publishing and bookselling activities. As literacy increased, the demand and supply for books grew and the book industry was transformed into independent commercial enterprises, each carrying out discrete activities that together covered all aspects of the production and distribution of a book. This evolution took place over time. In Britain it was not until the eighteenth century that publishing became a fully autonomous part of the book trade, and not until the twentieth century that design was given its own department within the publishing house. Initially, companies commonly sprang from book-selling activity and were mostly run by individuals or family members. Examples of early publishers who formed the beginning of a modern publishing industry include Thomas Longman, John Bell and John Murray (Feather, 2006).

Rose (2009: 342) argues that publishing only became truly modern around 1890, when publishers became ‘corporate business organisations’ with specialised staff and departments responsible for different functions. This is supported by Stevenson (2010: 3) who writes of ‘the emergence of a new type of publisher’ at this time. Writers who chart the development of the industry often credit particularly innovative individuals with the change and success of publishing. Yet, notably, while Rose and others point to new ideas and opportunities created and grasped by forward-thinking publishers, such as the move towards employing readers and editors in distinct roles, there is little mention of those in control of design, or any credit. In most cases, this was still handled by a printer. It was not until the late 1930s that typographic design as a specific role within publishing companies emerged. This change has been attributed to the large print-runs associated with the paperback editions published by Penguin Books, which needed several printers to fulfil (Banham, 2009: 289). Using more than one printing company required a detailed specification to ensure typographic consistency, thereby creating the need for a dedicated designer. From this point on, a few designers are recognised for their notable contribution to the commercial success of certain titles, with the most-regarded examples being Jan Tschichold and Berthold Wolpe. Tschichold made significant changes to design at Penguin Books during his short time between 1947 and 1949 (Doubleday, 2006); similarly, Berthold Wolpe was responsible for design changes at Faber&Faber in the 1940s. In spite of



the acknowledgment of a small number of designers, typographic design as part of the publishing process tends to receive less attention from publishing scholars than it deserves.

### **Publishing in the 21st century**

Since the 1900s, the industry across the globe has expanded enormously, developing into a multi-billion dollar business; the gross added value of publishing in 2016 in the UK alone was estimated at £11.6bn (Creative Industries Council, n.d.). While the industry has been adapting to changing technological, commercial and social conditions over the course of its history, it is the recent innovations in digital technology that have led to the most dramatic transformations. If there is any doubt about the extent of this technological impact, publishing expert Michael Bhaskar (2013: 41) removes it, stating that ‘books and publishing [are] experiencing the most profound transition since the dawn of the press.’ Similarly, the writer Thomas Bartscherer (2011: 5) states that nowhere have the impacts of information technologies been felt more than in the world of publishing. The changes and challenges that have occurred over the last twenty years have affected every part of the system—not least for design.

With few exceptions, the process of publishing a book has become entirely digital. This has not only led to changes in work flow and job roles; digitisation has changed the forms a book can take. The possibilities of electronic books (ebooks) and other publications created a new set of conditions for every part of the book trade. As mentioned, at the beginning of the twenty-first century, it was predicted that ebooks would replace print forms, causing publishers to make investment decisions based on speculation and short-term trends. Arnaud Nourry, chief executive of Hachette Livre, indicated that this has not been as successful as once anticipated, stating that with ebooks, the industry has had ‘one or two successes among a hundred failures’ (Flood, 2018). It has since become clear that print books have withstood the competition and currently remain the predominant output for most publishers.<sup>1</sup>

<sup>1</sup>. Figures from the Publishers Association report from 2017 show a continuation of the drop in eBook sales, while physical sales rose by 8%. (See references, Publishers Association, 2017).

Although ebooks are still in a relatively infant form (or ‘digital incunabula’), in comparison with printed books, currently they do not appear to satisfy everything that we require of a book.<sup>2</sup> Good typography is one of the differences, even if it is noticed at a subconscious level. Describing his love of ebooks at the time, the New York Times literary critic Charles McGrath once commented that it is surprising how ‘little you miss, once they’re gone, all the niceties of typography and design that you used to value so much’ (Carr, 2010: 102). This loss is exactly what book designer Dale Tomlinson fears. His high standards make him acutely aware of the failings in ebooks. He says:

I have not seen an ebook that works in a way that is other than absolutely appalling. It uses the worse fonts in the system, it justifies texts, it makes word-spacing wrong and it slopes italics. [...] And it seems to me that’s the ebook format and no-one seems to care less. They are just interested in consuming the information.

Systems have certainly changed with digitisation, but for a print-only publication, on the surface the workflow follows a familiar course. Previously, an author would supply a physical typescript (or even manuscript), which was copy-edited by marking up changes on a paper script. A book designer would work out a design on paper and provide written type specifications and hand-rendered layouts. Both marked-up typescript and design specifications would then be sent to a typesetter. In the era of off-set lithography and phototypesetting technology (the technologies that immediately preceded digitisation) a typesetter would key in the typescript and supply galley proofs which would be used to create a first set of made-up pages through manual cutting and pasting techniques using scalpels and hot wax. These would be read, sent back to the typesetter for revisions, and resupplied on photographic paper (bromide). Final artwork would then be made up, ready to turn into film for making printing plates for a lithographic press. Now, typically, an author supplies a digital typescript to a publisher, which is then copy-edited using word-processing software, and designed and laid out (or made up) on screen using

<sup>2</sup>. In 2015 Amazon introduced Bookerly for the Kindle—a custom-designed typeface to be easier to read. Amazon also created a better layout engine to improve basic typography through better justification and kerning (Brownlee, 2015).

design programs. Proof-reading may be carried out on screen, and the corrections often implemented by a designer working from an annotated pdf. If the book is to follow an existing design, codes can be added to the typescript by the copy-editor to automate the typesetting. Recently, the system has been further altered by some publishing houses, which have introduced the use of typefi®—software designed to automate the publishing process fully, making it possible to turn content into a number of ‘output formats for print, online and mobile’. As the company states, ‘The key difference between a Typefi workflow and a traditional publishing workflow is the separation of content from layout’ (Typefi, 2015).

The economic benefits of digitisation for publishers are evident: time and costs are saved through the reduction in turnaround times, transportation, skilled labour and physical materials. However, the changes are not without disadvantages. Although the digital workflow seems well defined, in comparison with early systems, the boundaries between the departments and their functions have blurred. As Luna (2009: 381) states, with non-digital technologies, ‘the roles of copy-editor, designer, compositor, and proofreader were still distinct and separate.’ Now, responsibilities of all agents involved and the stages of editing, design and production are significantly different. My interviewee, experienced book-designer Dale Tomlinson describes the pre-digital process he encountered in his first job at Penguin Books, and reflects on the changes:

One of the best models I’ve had was when working at Penguin. I wish it worked like this now. There was a basket, they had Ed 1 (commissioning) to Ed 2 (copyediting), to design to production. And this basket would start in one department and you’d carry it through to the next. So commissioning editor would take it with all the paperwork, hand it to the copyeditor, who would copyedit it, pick it up and bring it in to design. I’d look at the notes, design it, fill out the forms for typesetting – pre mac – make all the notes, do all the hand layouts. That would go off to typesetting. I would carry it through to production. [...] The good point about this model is that nobody interfered with anybody else’s job.

Dale describes a system at a time where boundaries and roles were clearly demarcated. That may no longer be the case, but it is not just within existing publishing companies that such boundaries have broken down; by removing barriers to entry into the industry (for example, the high cost of initial capital investment and advertising to reach target customers), digital technologies have created commercial opportunities for small-scale, independent publishing more akin to the fifteenth-century printing office, where the roles of book-making were less differentiated. Authors are seizing opportunities provided by the technology to produce, promote and distribute their own books—an activity which is becoming increasingly mainstream, especially as the terms and conditions offered by established publishers are less and less attractive. Book designers are also enticed into publishing. White's Books, set up by award-winning book designer David Pearson, is one example of such cross-over. Combining his expertise in design with his publishing insight, David creates fine editions of classic novels, commissioning well-known artists for covers and controlling all design decisions including paper and binding (see figure 1). Such ventures may be rare, but their existence shows the degree of flexibility that is now in play. It also shows the opportunities for product differentiation by placing emphasis on good design.



*Figure 1. Book designed and published by David Pearson. Cover illustration: Petra Börner*

Pearson, D., 2010. *Jane Eyre* by Charlotte Brontë. [Image online]. London: White's Books.

David Pearson is very aware of the ongoing challenges for publishers. He explains the effects of social media on titles that get published, and how this has a knock-on effect for design. He states ‘[...] you’ve got all these books now being made that are born out of social media or the internet. The company has to bend and shape-shift in order to do that. In its own way that is reflected in all the other design of the books.’ In some way, this benefits small, independent organisations, which can be quick to respond to a changing trend, especially as the cost of short-run printing is no longer prohibitive. For example, Rocket 88 captures fleeting demand by finding niche topics via tumblr and other social media sites. Once a trend has been identified, the company publishes extravagantly produced books, which might involve silk covers and individual boxes. One example is a book on ‘vintage black glamour’. Rocket 88’s editor-in-chief explained to me that the company has adopted an eighteenth-century method of publishing and distribution: they sell limited editions directly through subscription and advance sales (Peachey, 2018). In this case, the container is key.

Both White’s Books and Rocket 88 are examples of independent publishing that in different ways tap into a demand for books that meet desires not satisfied by content alone. In a limited way, this is being recognised by more mainstream publishers too. The existence of a demand for fine books prompted the publisher Faber & Faber to invest in letterpress printing and traditional books arts in 2013. Director Nigel Marsh put forward reasons for this business decision, explaining that the company was looking for ways ‘to retain a strong connection to the crafts associated with publishing’ (Marsh, 2015). This would have been an unlikely move had they not perceived a market for books of a higher material value and better standards of typographic design. By transforming the supply side of the book market, digital technologies have affected the demand side too, creating a gap to be filled by publications with qualities that are different from digitally produced versions. My argument is that aspects of pre-digital design processes may have benefits for the design of a book that goes beyond a current market for collectible, fine print editions. It is possible that physical processes have a place in mainstream book publishing, if a book is more than the content it transmits. I now turn to recent theories on publishing and the current focus on content.

### **Recent publishing theory and new visions**

While there is no shortage of writing on the history and activity of publishing, there is a lack of understanding of the industry as it operates today. (Thompson, 2010). The recent ‘revolution’ in the book trade calls for a similar revolution in the way we think about the publishing system. Writer and publisher Michael Bhaskar (2013) makes this point, saying that a new understanding of the industry is required if it is to secure a successful future. His argument for greater theorisation of publishing is well supported, but I suggest that any review is incomplete without greater attention on design, for the simple reason that the design of a book as a whole entity is integral to the meaning of content (McKenzie, 2002), and also to how we read, comprehend and recollect it. A book is more than the information it transmits.

As both a sociologist and the director of the academic publishing house Polity Press, John Thompson has both scholarly and commercial interests in publishing research. The second of his two books examining the state of the industry in the twenty-first century refers to publishers as ‘merchants of culture’ (Thompson, 2010). This foretells his understanding of publishing as an industry that acquires and creates cultural capital, or trades in a cultural commodity. He analyses publishing activity by identifying the resources and capital that is available, such as economic, human, social, intellectual and symbolic. While the first four are largely self-explanatory, the last refers to the ‘accumulated prestige’, or the respect that has been established over time (Thompson, 2010: 8). This ‘intangible’ resource is a particularly relevant point for today’s publishers, where their authority, or their roles as gatekeepers and ‘arbiters of quality and taste’ (8) are being undermined by digital networks that enable access to readers’ reviews. For example, a self-published book may gain regard through comments on sites such as Amazon or Good Reads. However, quality and taste are to a degree signalled by good design, if simply because the content is considered worth this investment. Yet design is an aspect that can suffer with self-published titles and automated, digital processes.

Thompson’s research provides useful insight into the changes happening within the publishing sector, but there are some aspects of his analysis that are less valid eight years on. For him, the revolution within the publishing indus-

try is a revolution in process more than product, and it is the model of the 'life-cycle' model of the book that needs revision. He observes that a printed book looks much the same as before, even though the way it has been written, designed and produced is entirely different. (Thompson, 2005). Whether we browse in a bookshop, or order print books online, to an extent this still rings true. While he is right to focus on process in examining change, and right that the printed book remains familiar, the developments of electronic forms of the book certainly represent a revolution in product. This introduces an additional challenge to our understanding of publishing, and this is where Bhaskar picks up.

As a contrast to Thompson's idea of publishers as 'Merchants of Culture', Bhaskar describes publishing as a machine for content. (Bhaskar, 2013.) This not only shows the difference in their perspectives, it shows the difference made by the three years that separates their work. In 2011 Amazon introduced the Kindle—an e-reading device that expanded the viability and popularity of electronic books. In this regard, Bhaskar had the benefit of writing in the light of the new possibilities and his book is directed more at anticipating the future of publishing than in analysing its present state. Yet, neither dedicate much of their books to directly considering the role of book design. I suggest this is in part because digital technologies have integrated book typography into other parts of the process, obscuring its function and value.

Both Bhaskar and Thompson believe that publishing needs a revision. For Bhaskar, 'Publishing has been thoroughly explored [...] but not adequately theorised.' (Bhaskar, 2013: 4.) For Thompson, the diagrammatic model of the life-cycle of the book (first put forward by the scholar and librarian Robert Darnton in 1982) is no longer accurate as a picture of the complex links between all agents involved in the production and consumption of a book. Although the model has since been updated by publishing scholars such as Padmini Ray Murry and Claire Squires (2012), these still have links with a more conventional idea of publishing. Bhaskar makes the case for an alternative perspective. He outlines publishing history from the time of Gutenberg to that of today, concluding that he sees an industry that is now in crisis. He views the problem as residing in the way publishers think of themselves, arguing



that they have limited their ability to innovate because they have failed to stop identifying themselves as book makers. Set against Iain Stevenson's book on publishing entitled *Book Makers* written just three years earlier (2010), the progressive nature of this assertion is evident. What Bhaskar attempts to offer is a way of breaking free from this hindrance, or this delusion, by suggesting a different way of viewing the inputs and outputs of the industry. In essence, his assessment of the industry is that we have moved from a 'container' model of publishing to a 'content' model and that crucially, this needs to be fully appreciated to lead the way forward. Content (ideas and knowledge) is the industry's resource, and the many ways this can be manipulated must be a publisher's concern, thereby releasing themselves from the constraints imposed by any particular form. In other words, the idea of the physical, three-dimensional printed book as a container for texts and images, knowledge and ideas—literally and metaphorically—must be rejected to allow publishing to adapt and flourish. For Bhaskar, content is primary and he argues that from this perspective, the activity of publishing, past, present and future can be reassessed.

To recap, Bhaskar's interpretation of publishing is as a machine for content, where the container is largely unimportant. This is based on his irrefutable argument that publishing is inseparable from content—a point with which Thompson would agree, although Thompson considers that content is just one element of publishing capital. In the process of his argument, Bhaskar insistently and deliberately achieves his aim of liberating the industry from its deep association with the codex. Through the use of the term content and emphasising its independence from a physical form, he instils an aura of insubstantiality and dematerialisation around the industry's products. This is in line with Bhaskar's view that publishing deals with intangible value (Bhaskar, 2013: 2). This is not hard to follow, but his approach fails to acknowledge that the intangible (i.e., content) is made valuable through the form or container in which it is embodied, and that value is heightened with the attributes of stability, longevity and aesthetics. Publishers may no longer be described as book makers, but they are certainly keen to be profit makers and that profit is not independent of the value that can be added to content through design. Rocket 88, as mentioned above, is an example of a publisher which sees the con-



tainer to be as important, if not more so, than the content. Although at one point Bhaskar states that design, along with editing, adds to the ‘value chain’, he seems to put this aside in his conclusion. I suggest that while his view of the future is easy to imagine, it could be a destructive one, given the current signs of a turn towards physical things and a greater appreciation of their aesthetic, sensory qualities.

### **Content versus container**

While Bhaskar’s vision provides an apposite addition to current debate, I argue that elements of a container model of publishing still have a valid place in the industry, if not least because it recognises the value added by material properties and the significance of design. As explained above, for some publishers, the container is still the main event.

To describe how content can be manipulated, Bhaskar introduces the idea of framing, citing the physical book as simply one of many frames. This seems a sound analysis, and as he acknowledges, framing is in some ways a substitute word for container. However, Souttar questioned the use of the word content several years before Bhaskar brought it centre stage, wondering why the term has attracted little critical attention. The idea of content in its simplest, Souttar says, ‘is that the information component of a message can be distinguished from the form in which it appears and manipulated quite apart from it’ (Souttar, 2000: 174). With earlier media, content and form could not be conceptually separated. Bhaskar’s point relies on the idea that now it can be. His work is convincing if we ask only that it is an interrogation of what the word publishing can mean. It is less convincing if we ask that it holds the key to the future of the industry. There is reason to think that if we deny an interdependence between form and content—between form and meaning and between form and value—we may lose much of what the book contributes as a whole. In other words, content is of diminished worth without the attributes of its form.

However, given today’s digital environment and his own professional experience, Bhaskar’s arguments have weight. They are also somewhat foresighted. He concludes with a vision of a publishing world populated by people with

skills different from the present, mainly comprising software developers and coders, social media experts, brand managers and perhaps the occasional person with a more conventional editorial role (Bhaskar, 2013). There are already examples of a shift in this direction, as we are seeing with Typefi. In addition, a recent merger involving a major science publisher has resulted in significantly greater automation. A senior person at the company described the move to a ‘digital first workflow’ and explained that this is ‘a world populated by coders who have a different understanding of the word design. We have had to introduce some really ugly and odd elements in the printed issues and online PDFs that were dictated by the constraints of the systems we have adopted’ (Pers. Comm. name withheld. 2018).

The change in the understanding of design clearly has negative consequences in this case and, more generally, may be short-sighted given the consumer trends identified by David Sax (2016). In *The Revenge of the Analog*, he cites statistical information on the unexpected resurgence of retail bookshops in response to the demand for the printed book and the opportunity to browse. If this continues, there is every reason for book designers to feature as much as software engineers in publishers’ future plans, but also for an evaluation of the effects of digital processes on design.

### **2.3. Book design: definitions and practice**

#### **What is book design?**

As I have indicated above, a book is more than a technology for transmitting information and its design is part of its cultural worth. A book’s value as a material object is discussed more fully in chapter eight, which focuses on materiality and our relationships with physical things. Here, I provide relevant background to the practice of book design from the early days of printing to our current digital era, to establish the roles and processes of design before examining the effects of digital technologies in the chapters that follow.

If publishers were once printers, they were also designers, overseeing or carrying out acts of ‘typographie’ and controlling all the material aspects of a book within technological constraints. The English printer (and mathemati-

cian) Joseph Moxon was one of the first to write on the practical and historical aspects of printing, typefounding and typography in the late 1600s and provided an early definition of a typographer as a person that performs or directs ‘all the handy works and physical operations relating to typographie’. (Moxon, 1703, cited in Gadd, 2013: 6). This activity happened entirely within the printing house itself. While Moxon distinguished between printer and typographer (Kinross, 1992), the emergence of the specialist typographer and book designer did not become established until the 1930s, in line with the general delineation of graphic design as an independent profession and field of study (Dormer, 1997). The American designer W.A Dwiggins was a pioneer in this respect, designing books for the publisher Alfred A. Knopf from 1926 (Shaw, 1984).

Typography is not solely for the purpose of books, although in Moxon’s day, it was an activity solely for printed matter. Moxon’s definition is inadequate to capture the work of later typographers and is especially inadequate for the age of digital media, with the possibilities for motion typography and interactivity. Typographer John D. Berry (n.d.) provides a more appropriate definition of typography as ‘the art and craft of arranging pre-formed letters to convey the meaning of a text.’ Berry also acknowledges that ‘The forms in which words are communicated keep growing and changing, as we invent new technologies to convey them, but the fundamental purpose remains the same.’ No matter what the medium, ‘the purpose of the typography is to communicate the words’ message’ (Berry, n.d.). This emphasises the link between content, communication and typographic craft.

The art of typography and book design go hand-in-hand, but they are not synonymous. Printed books are three-dimensional objects that are largely, but not exclusively textual documents and their design extends beyond typographic decisions. The relationship between them is made clear by book designer Geoff Green who described himself to me as ‘a typographer who specialises in book design’. An expertise in typography is essential to his practice, but good design requires more than typographic knowledge and know-how; it requires an understanding of materials and physical processes. This was more evident in pre-digital times, where design decisions had to take into account

the nature of materials such as paper and the processes of printing and binding. Geoff elucidates this point when he talks about the connection between design and materials that were essential in his earlier experiences:

When you designed a book at that time if you chose Bembo for the text face, you would then have to carefully ask, or think, about what paper it was being printed on. Because if you put Bembo on an art paper it would look too thin, you needed to put Bembo onto a laid paper because then it could be thumped and so on.

In contrast to definitions of typography, twentieth-century definitions of book design reflect the extent of knowledge and experience that the activity requires. They describe a practice that extends beyond the arrangement of letters to include decisions about structure and materials, although they are interdependent. Book design is variously described as a combination of art, craft and technical elements, requiring both creative and analytical thinking in varying measures. Designer Hugh Williamson (1983: 1) defines his craft as ‘The planning which determines the physical characteristics of the book, including particularly its dimensions, its general appearance to the eye, its structure and mechanism, and its durability.’ He refers to ‘the whole craft of book design’ (1983: 1), categorising it as a form of industrial design, devoted to the service of reader, author and commerce. This definition places emphasis on planning, indicating how all aspects are interconnected. However, although he rightly refers to all the physical attributes of a book in his understanding of what book design encompasses, in practice, the extent to which designers are involved in decisions such as format or stock is increasingly limited. To an extent, this has always been the case, yet my interviewee Geoff Green indicates that in the past a designer had more of these responsibilities, stating that ‘... in those days ... the designer was very much involved in the whole process of the book, which they are not today.’ In an interview conducted by Judith Bastin (1977), book designer Peter Guy talked of his luck at being involved with the entire process of the books he designed at the publishing house Gordon Fraser, acknowledging his degree of control was the exception rather than the rule. The fact that such level of involvement is unusual is significant and, perhaps more so if we consider book design in the light

of Bhaskar's perspective of content separated from form. While the purpose of typography is to convey the meaning of a text, with a book, all material qualities shape the act of communication and therefore affect meaning. Bibliographer Donald McKenzie (2002: 259) makes this point unambiguously declaring that 'every element of the physical book conveys meaning and thus contributes to our understanding of the work as a whole.' If this is the case, there are grounds to argue that a book designer should have sufficient knowledge and practical understanding of physical materials and process in order to contribute to all decisions regarding a book's physical attributes. This is an argument I develop in later chapters, where I draw on theories from the cognitive sciences to consider the role of manual engagement and sensory perception with respect to different forms of cognition and the implications for design process.

Book design requires more than planning and technical knowledge to achieve its purposes; it also requires creativity. The work of the Swiss designer Jost Hochuli highlights this creative element. Winning an award in 1999, the prize committee described Hochuli's work as combining 'individuality, imagination, modernity, exact knowledge of historical connections, with a functionality, which, deployed with virtuosity, is always put to the service of the reader and the content being designed' (Anon, 1999: n.p.). This draws attention to each book's individuality, implying also that serving both reader and content demands more than typography that makes reading easy. This is something to consider in the light of increasing trends for standardised design for the printed book, but also with respect to Bhaskar's notion of frames, which he defines as 'distribution mechanisms' (Bhaskar, 2013: 84). If a print book is one type of frame, then it follows from Bhaskar's reasoning that a book is a mechanism for distribution. In the light of Hochuli's work, this seems rather lacking.

### *'Invisibility'*

There is one further point to add to an understanding of book design and its purpose. My interviewee Geoff Green has worked exclusively as a book designer for several decades, but he is not alone in mentioning the long-standing idea that good book design (and particularly, book typography) is invisible.

Geoff refers to Francis Meynell (the founder of Nonesuch Press) to remind me that ‘design should be anonymous. You should be able to read a book from beginning to end without being aware of its design and if the design intrudes in any way it is not a good design.’ This idea is more usually attributed to designer Beatrice Warde, who, in a collection of essays entitled *The Crystal Goblet* (1955) used the notion of a perfectly balanced, crystal-clear wine glass as a metaphor for good typography (Warde, 1955). Her argument was that typography is best when it is unobtrusive, or, when ‘everything about it is calculated to reveal rather than hide the beautiful thing which it was meant to contain’ (Warde, 1955: 11). It is worth noting that she refers to both the way the object handles as well as its visual transparency.

In a similar vein, designer and letterpress printer David Jury offers that ‘Design needs to fall away enough for the words to mean most.’ Berenice Howard-Smith, who currently works as a design lead at Cambridge University Press, concurs, saying ‘At the end of the day design should be a silent force! It should be quietly getting on with what it’s doing, it shouldn’t interfere – that’s the art of successful design...’ If unobtrusiveness and invisibility is inherent in—or a condition of—a well-designed book, it is less surprising that it is the part of the publishing system that resides in the background.

## **2.4. Book design in the twenty-first century**

Book design has been widely seen within the profession as an art and craft that encompasses all physical, material aspects of the book, drawing on a range of technical and historical knowledge, creative thinking and practical skill. However, in practice, book design has generally been more limited to typographic decisions. As typography is partly based on rules such as knowing the relationship between the characteristics of a particular font and inter-linear spacing, it is also seen as easy to automate. This view disregards the creative element that Hochuli and others make apparent.

In the course of conversations with my interviewees, some useful descriptions emerged on the nature of their trade and what book design means for them. In spite of variations, the comments showed a general consensus. When

asked what he considered book design to be, Dale responded ‘For me it is always a craft and art, absolutely.’ He project manages many of his freelance jobs and believes this ‘has always been the book designer’s job.’ As project manager, he has influence over all material aspects of a book, similar to the experience of Guy, working in the 1970s. This is fitting, given Dale’s considerable knowledge of materials, printing and binding, which comes across strongly through the interview. He reveals how he thinks of the book as a whole: ‘... you create a book that you know you have specced, designed, got all the typographic details right, the materials, paper, binding.’

At the time of interview, Susan Wightman and Michael Mitchell were working as partners at The Libanus Press. Although with different backgrounds, they clearly shared the same ideas and values in relation to book design. Both stress the analytical nature of the work. Michael states that ‘The essence of designing a book is being able to define the parameters’ and adds that it is also about ‘analysing what the content is.’ Susan explains that ‘.. it’s not a purely visual thing, you need an editorial understanding, you need to know how information is structured, how it works as well. It’s – you’re straddling between the visual and the editorial worlds.’ For Susan, the goal is ‘... making the connection between the reader and the author.’

Dale, Michael and Susan point us back to the connection between form and content. Dale reminds us of McKenzie’s view that material properties are not separate from the way we understand a book, and Susan reveals how she sees her role as communicating a message through the physical form. Bhaskar’s notion that content should be viewed as a separate entity is at odds with what designers perceive, where content and its comprehension is dependent on its embodied existence.

Designers Alistair Hall and David Pearson both use the word ‘content’ when they talk about the activity of book design. David ends one thread of our conversation by coming to the conclusion that ‘if you are a decent designer you should listen to the contents and what they need. [...] Ultimately you have to listen to what the content needs.’ The designer grapples with how best to communicate the message by giving it form. Alistair offers an interesting insight



into the attitudes of designers. He comments: ‘As designers we care about the container, or the way the container enhances or adds to the content.’ This is especially germane in the light of Bhaskar’s insistence that publishers must move from a container model to one that focuses on content. Alistair’s point indicates that designers remain attuned to the idea of a book as a container and the value that this adds. In order to find a place in Bhaskar’s publishing model and the digital first workflows, designers may need to redefine the aims of their profession and the means by which those aims can be achieved. In doing so, they may lose connection with the actual purpose of design.

### **The future of book design**

Although the emphasis placed on each element of book design process varies, it appears that the definitions that have been in circulation for the last hundred years remain largely relevant for the current designer. Collectively, they show the combination of skills, historical and technical knowledge and creative thinking that the activity involves. Much of this is still relevant for our digital age—at least, for a printed book. However, digital technologies have affected the range of skills designers once called upon, especially the manual drawing skills that were an everyday part of design in pre-digital environments. For the printed book, good design still requires the ability to plan, a sound knowledge of typography, aesthetic sensibility and creativity. These are combined to find solutions to aesthetic and technical problems in order to satisfy the needs of authors, publishers and readers—just as before. Berry is certain that with typography at least, the principles don’t change, only the means. Yet, with the new visions of publishing, it is unclear if those principles will serve future needs, or, how much the means are affecting our ability to best serve those principles. It is the second of these uncertainties that the following chapters seek to address. The tools and materials that are used to achieve current needs have certainly changed and at a rate that makes it hard to assess the longer-term effects. The extent of change caused designer Richard Hendel to note in 1998 that ‘computers have radically changed how designers work’ (1998: 5). Fifteen years on, he wonders if his second book, *Aspects of Design*, is nothing more than an ‘epigraph to a dead craft’ (2013: xx). He opens with the sentence ‘Because these may be the final days of what we now know as book design, what follows may eventually turn out to be merely the reminder



of a quaint aspect of graphic design.’ (Hendel, 2013: xi). It is easy to see what lies behind such a viewpoint. Eulogising about the ebook, New York Times writer Charles McGrath wrote about how ‘little you miss, once they’re gone, all the niceties of typography and design that you used to value...’ (Carr, 2010), with the implication that good design could become obsolete. It may be no coincidence that Hendel’s pessimism was concurrent with Bhaskar’s new theories of publishing; in both cases, book design looks to be redundant. Yet, in spite of the predictions of the death of the physical book, and concerns similar to the one expressed by Hendel, there is evidence to suggest that these ‘niceties’ are indeed missed, if only subconsciously. People may be aware of good design, but lack the means to articulate it. The slow-down in growth of ebook sales, and correspondingly the rise of sales of print books—and significantly of hardbacks—suggest that factors such as design, permanence and tangibility are outweighing the advantage of portability for the book consumer, and that ‘the container’ does indeed matter. For a designer like Simon Loxley, the aim is ‘To make it as irresistible an item as possible’.

## **2.5. Concluding points**

No matter what model of publishing we draw on, the financial rewards of publishing are derived from the value it adds to content—a publisher’s raw material. As I argue above, part of this value is the product of design. To what extent, is hard to measure, but there are instances where the design of a book has unquestionably contributed to its success. One example is provided by ‘The Great Ideas’ series initiated by editor Simon Winder and published by Penguin Books in 2004. This collection of historical texts was designed by David Pearson, along with others that he commissioned for several of the covers. (See figure 2, overleaf.) Many of the texts date back to the first century and all have been published in numerous editions over the years. Yet the volume of sales in the newly designed paperback form, with covers that hint at past processes, has been remarkably high; by October 2017 the series had sold over 5 million copies worldwide (Pearson, 2017.) This success indicates how demand can be created through excellent design—from overall concept to typographic treatment and the qualities of production materials. So far, what can be achieved in this regard is limited with the digital book.

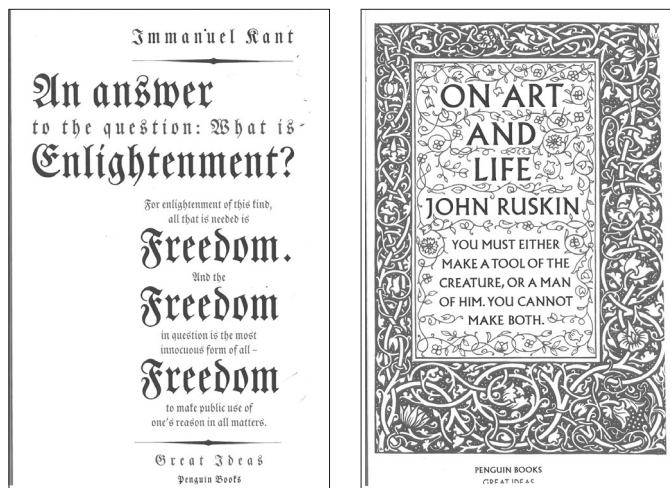


Figure 2. Examples of book design for Penguin Great Ideas series.

Left: Dixon, C., 2009. Immanuel Kant. *An answer to the question: what is enlightenment*. London: Penguin Books.

The effect of typographic attributes on book buyers is, finally, a subject of study. A collaborative project currently in progress run by researchers from UCL, Durham University and Anglia Ruskin is hoping to identify whether the worth of content (a text) is judged differently in relation to varying design qualities (publication forthcoming, 2019). While at this point we can only speculate about the results and what conclusions they may lead to, it is safe to draw on statistics to indicate that the customers of the publishing industry are regaining interest in the conventional book, against all earlier predictions. Hardback sales have ‘surged’ and the rise of ebook sales fell in 2016 (Cain, 2017). Peter Mendelsund, quoted in a newspaper article entitled ‘How real books have trumped ebooks’ stated that recently, ‘books have “more cloth, more foil, more embossing, page staining, sewn bindings, deckled edges”’ (Preston, 2017). This fits with Bhaskar’s (2013: 191) suggestion that the digital environment has raised the values of print production as ‘The uniqueness, craft and physicality of a book are assets in this weightless and intangible world.’ It therefore follows that design is far from being a sideline issue, or a dying craft, whether viewed from the position of a publisher or that of a consumer. The question remains whether digital technologies are affecting the knowledge and skill of designers and their ability to produce a book with such uniqueness, craft and physical attributes.

### **Chapter 3: Design research and the value of physical processes**

In the previous chapter I outlined the history and evolution of the publishing industry and briefly discussed changes brought about by digital technologies. I introduced new theories of publishing and demonstrated that although over the course of the last thirty years form and content have become more disconnected, in contrast to recent views, they should not be seen separately. I argued that designers have a crucial role not just in adding value to content, but also in communicating (or ‘effecting’) meaning. However, without the ‘container’ in which content can be embodied, this value becomes diminished or obscured. Building upon this work, in this chapter I focus on design process and consider research that looks at the nature and use of physical materials and processes. This is in order to understand better the differences between pre-digital and digital technologies for design thinking and whether there are any advantages of working with traditional media.

Given that it is rather a niche specialism, the shortage of research specifically directed at the process of book design is not surprising; for this reason, the studies I refer to below include those borrowed from related design disciplines. In particular, I draw on architecture—a field I consider has some kinship with book design. However, my discussion predominantly draws on one significant study conducted by Rachel Hewson over twenty years ago—a study that is rare in that it focuses entirely on typographic design and the role of traditional, pencil and paper sketching specifically for that purpose. While technology has advanced since this research, her detailed examination of sketching for typographic design is still pertinent and, arguably, even more so as the software has advanced, removing some of the earlier inadequacies and adding more possibilities. By presenting a list of characteristics and functions that sketching with traditional media offers, Hewson provides some relevant insights, which I incorporate into my assessment of current design process. In the first half of the chapter I give an account of Hewson’s study and discuss

how I am drawing on her results to inform my research. In the second half I compare Hewson's findings with my interview data to investigate the degree to which digital sketching can perform the same functions. I show to what extent traditional media is still used in the initial design stages, discuss what advantages designers think these provide and highlight any significant changes in contemporary practice that can be attributed to the switch to digital processes.

### **3.1. Digital technology and design**

Before I turn to Hewson's work, I must first provide some background to digital typography and outline some recent interest in the use of non-digital processes and what they can offer. In spite of the greater scope that digital technologies evidently provide, not everything that traditional processes offer has been replaced. When the Apple Macintosh computer (Mac), along with layout software and digital type were first taken up by book designers, the possibilities seemed astonishing. After many years working traditionally, my interviewee Geoff Green recalls his early response to using a Mac, saying 'I found it stunningly good'. Now, we encounter similar responses to pre-digital processes, such as film photography and letterpress printing. There are many ideas in circulation that help explain what these processes have to offer—for example, that working with our hands helps us learn 'aesthetic, mathematical, and physical principles through the manipulation of physical things' (Crawford, 2009: 31)—but there is some way to go to understanding fully what manual processes contribute and why they are currently attractive.

One of the early effects of digital technologies on typographic design was to stimulate innovation and experimentation. The opportunities that were opened up in 1984 by the Mac, along with desktop printing and creative software, led to the kind of pioneering work exemplified by designers such as Rudy VanderLans and Zuzana Licko. Licko's background in both computer programming and graphic design made her perfectly suited to exploring the potential offered by the new technology, inspiring her to create digital fonts that harnessed the qualities of the digital environment and challenged conventional design sensibilities. The technology also made it possible for Licko and her

partner VanderLans to self-publish a design/culture magazine, *Emigre*, exploiting the desktop-publishing possibilities offered by digitisation, and allowing text editing and layout to happen at the same time. The magazine used Licko's experimental bitmapped fonts, which were then made commercially available through their own type foundry. Her early bitmapped fonts made way for more traditional ones, such as Mrs Eaves, based on Baskerville in 1996 (Emigre, n.p, n.d). Although the last issue of the magazine was published in 2005, the creation and distribution of fonts is the main activity of Emigre today, 35 years on from its inception. Licko and Vanderlan's early work altered the boundaries of the field and led the way for others with non-conventional specialist skills to design, produce and distribute digital typefaces independently. Since then, small-scale foundries have become an established part of the contemporary typographic scene, adding greatly to the number and style of fonts for widespread use. Significantly, the increase in available typefaces and the autonomy from typesetters that this allows is one of the advantages that book designers most appreciate. One of my interviewees, designer and writer Simon Loxley explains: 'Occasionally if I've dug out things I've done pre-digital, it's interesting to look at them and think about [things] ... you realise the loss – well the lack of typographic control you had because you had to send things away to a typesetter.' More emphatically, experienced book designer Dale Tomlinson states 'I'm glad I'm in that era of using digital type because as a freelance it gives [me] complete control over what I do.' It is worth noting that these comments are made in the context of comparison with phototypesetting systems, which were not always supported by type that was designed specifically for the technology. It is also worth noting that both Dale and Simon are self-employed; the level of control over the typesetting they refer to is not necessarily afforded to designers working in house, where the choice of typefaces may be restricted by the purchasing decisions made by others in the company. Dale provides an example of this, by recounting that his previous employer has recently made unavailable to in-house designers the book typefaces that he had knowledgeably introduced during his time.

Digital technologies continue to offer new possibilities for authors, publishers and designers through interactive network capabilities, the immediacy of in-

formation and distribution, and simply greater automation. Yet, in the last few years there has been a noticeable resurgence in the use of traditional technologies in certain areas. My participant book designer Phil Treble set up a letterpress studio as an alternative to his freelance digital work in order to be more creative, and designer David Jury has been printing his own books by hand for a considerable time. Letterpress processes are also being resurrected for use within colleges of art and design, as well as being used successfully for commercial activity. The number of private presses is on the rise and, while these are more concerned with aesthetics rather than profit, the mainstream publisher Faber&Faber is an example of a more business-minded step towards a return to fine printing. This is consistent with the general trend towards analogue technology, as testified by the substantial surge in demand for vinyl records and a more apparent use of physical notebooks for personal organisation and note making.

This shift indicates a growing attraction to the qualities of physical, tangible objects in our age of digital intangibles. An interest in traditional craft and the handmade has been evident for several years and the appeal of physical processes is growing within art schools, as mentioned above. Design educator Steven Rigley (2005: n.p.) attributes this to a wish for ‘a heightened experience of making’. But does such heightened experience provide something more? This question has been asked before and studies have been set up to explore the value of physical processes for design education. One such study, The Codex research project (Edwards, Lockheart and Raein, 2002), concluded that interaction with letterpress technology helped to develop students’ imaginations. This is a useful finding, but it does not pursue the reasons why this might be the case to any depth. Building on the idea that letterpress is useful for understanding typographic principles, the 6x6 Letterpress project (Cooper, Gridneff and Haslam, 2013) aimed to investigate how its use can lead to new ways of learning, mainly through an emphasis on the workshop environment as a means of encouraging experimentation. While the project is not specific to book design, the authors make some relevant points. First, they allude to the way physical processes make apparent the connection between design and production—a connection that digital technologies tend to obscure due to the lack of constraints that are inherent in physical objects and

media. Material awareness is important for book design, yet can become sidelined. Second, they suggest that physical processes such as letterpress technology develop skills that are transferable. For the authors, these skills include ‘an appreciation of physical space and the slower speed of work fostering reflection through design.’ Time to reflect on a design idea is something that the digital environment does not encourage. Practising designer Simon Loxley indicates this in his comment to me:

If it is something that is going to come out and be a physical object at the end, I think you need to have that connection from the start. And I suppose you can maintain it by printing out things fairly early and laying them out and having a walk around it, which is a process that gets lost with digital. It’s almost that fine art process – a lot of the most valuable time spent is not actually painting but by staring at it, and deciding what’s right or wrong and where you go.

Although their findings are useful, neither study explores in any depth ideas of tacit knowledge (knowing through doing, rather than ‘knowing that’) or embodied cognition (where mind and body are interdependent in cognitive processes) to investigate why these physical processes might benefit design practice. It is easy to find reasons for this omission. An understanding of human cognition is notoriously elusive, which makes any investigation of mental process, creativity and imagination correspondingly difficult. However, embodied cognition is an area of neuroscience that is gaining increasing respect and recent theories in the field can provide a useful perspective on design process. I discuss this in depth in Section II, but with the notion of material engagement in mind, I first return to Hewson’s study on the physical act of pencil and paper sketching to examine its value for book design.

### **3.2. Sketching and typographic design**

To recap, the shift from pencil and paper to mouse and screen for the first stages of book design is one of the most significant changes in process to have occurred in the last three decades. Previously, designers used drawing on pa-







sketching in the early stages of design work. Her thesis, entitled *Marking and making: a characterisation of sketching for typographic design*, was based on ‘the premise that sketching in paper and pencil is crucial for typographic designers when designing documents’ (Hewson, 1994: n.p.). She arrived at this hypothesis through her observation that designers were continuing to use pencil and paper for their initial designs in spite of their mastery of digital tools, thus prompting questions about the relative benefits of traditional media. Through a series of case studies and observations involving practicing typographic designers, she identified a set of characteristics of sketching, and used this to create a list of the functions that she associated with each characteristic. This enabled her to make insightful comparisons between traditional and digital tools in terms of their purpose in the initial stages of design. One particular strength of the study lies in the fact that it takes into account both visual and tactile aspects of working with pencil and paper.

For pre-digital book design, sketching and drawing were an essential part of the process, and had a range of functions. The questions that needs to be asked are: which of these functions are met, or improved, by digital tools, and are there are any that have been detrimentally lost? Hewson’s examination of traditional sketching provides a useful ground from which to make comparisons. Therefore, a detailed account of her work is necessary to explain the points that I draw on to examine the reflections provided by my participants.

To begin, it is necessary to understand what sketching is in the context of typographic design. Hewson defines it as ‘the making of 2-dimensional representations that both reflect and stimulate design ideas in the designer’s mind’ (1994: 10). This highlights one of its purposes: to capture an idea, which can suggest and lead to others. Of course, this can equally apply to what my participant Dale Tomlinson refers to as ‘digital sketching’, yet Hewson elaborates, adding ‘These ideas are often only partially formed whilst still in mind, and the externalisation enables the designer both to see an instantiation of the idea, and hence to develop it. The sketches are a diagrammatic shorthand, possessing only the essential aspects of the idea they embody’ (1994: 10). With digital tools, some aspects of first sketches appear to be lost from the process. This is a point I discuss further on.

Hewson's description of sketching indicates a link between mental visualisation and how we engage with external objects to help us think. Although she does not make this connection herself, her point relates directly to theories of embodied cognition, as I show in chapter five. By highlighting the way sketching can be used to capture just 'essential aspects', Hewson already hints at an important difference between a pencil sketch and its digital counterpart. Even the quickest 'digital sketch' does not have the looseness or inexactitude of a pencil, losing its aura of temporality. As some of my participants suggest, this quality, or lack of provisionality, can lead designers to respond differently to their initial ideas. Graphic designer Alistair Hall has less experience of traditional tools than my older participants, but is a reflective practitioner who specifically designs for print. Although his design education and experience has largely been based around digital tools, he explains 'I think there is a seduction in the computer screen that can be misleading because you can think ah, I've done it because it looks complete already ...' This is a direct contrast with pencil sketching which always presents itself as unfinished—always as an idea.

### **Features and functions of traditional sketching**

There are several characteristics particular to the use of paper and pencil. With data collected from interviews, observations and discussions of sketches made for earlier jobs, Hewson identifies eight features of traditional sketching, which she initially labels as follows: scale; closure; degree of detail of overall representation; precision and tautness; degree of detail of typeface attributes; multiple sketches; mixture of visible languages, and artefact simulation. Having determined these characteristics, she goes on to detail the functions that each performs. To varying degrees, all of her points are useful in going some way to drawing out changes catalysed by digital tools. Taking each in turn, I summarise Hewson's eight features and six functions, before I outline how I draw on these to identify changes indicated by my own data.

## **FEATURES**

### ***1. Scale***

On paper, a designer can create quick sketches of a part or whole of a design, switching easily from thumbnails to actual size. At a small scale, it is possible to gauge the spatial relationships and balance between elements, while a larg-

er-scale sketch enables greater detail and the possibility to focus on selected elements.

## ***2. Closure***

This refers to the degree to which an image remains unfinished. With pencil and paper, a sketch is often half rendered. This lack of completeness implies its lack of finish, which has the advantages mentioned above. I also see that this can free a designer from pressure to complete an entire picture, perhaps encouraging more initial exploration.

## ***3. Overall degree of detail.***

Book design is concerned with relationships between elements as well as typographic specifications, and both aspects can be worked out to varying levels of detail with a pencil sketch. Less detail can be useful for simply considering where something happens, before being developed. Switching quickly between different levels of detail can also be beneficial.

## ***4. Precision and tautness.***

Hewson uses this to refer to the closeness of the sketch to the appearance of the final object. If a sketch is precise, it has closure and all elements worked to a high level of detail and tightly drawn.

## ***5. Degree of detail and precision of typeface attributes.***

Type can be rendered more or less precisely, as can typographic detail. For example, tonal variation can be used to indicate the weight of a font, where a dark line represents a heavier weight. Type can also be drawn up precisely.

## ***6. Multiple sketches.***

Several sketches can be made on one sheet, showing different scales, degrees of closure, detail and precision. Different parts of a whole design can be extracted and rendered to different levels. The advantage here is that a designer can quickly capture a number of ideas and flick between the whole and parts. Everything is within the designer's field of vision.

## ***7. Mixture of visible languages.***

One noticeable feature of pencil and paper sketches is the degree to which

visual and written languages appear together. Written notes add a commentary, for example, listing possible typefaces or making numerical calculations. Although recent advances in digital styluses such as the Apple Pencil make note-making more possible, this is limited to certain devices. [See chapter seven for a discussion of the merits of this.]

### ***8. Artefact simulation.***

On paper, a designer can represent the object in a three-dimensional form quickly and easily. In addition, the medium encourages direct physical manipulation, allowing a three-dimensional simulation of an object to be made. In this way, a designer can observe and handle the the object simultaneously, gauging qualities such as format and sequence more immediately.

## **FUNCTIONS**

As mentioned, these features perform functions that aid design thinking, or conceptualisation. She specifies these as: focus; provisionality; switching; record keeping; comparison and simulation of experience. Again, I give a précis of the relevant points.

### ***1. Focus***

Hewson states that to find a design solution, a designer must resolve all aspects both separately and in conjunction with each other. I think of this as having both macroscopic and microscopic vision, switching focus between the whole and its individual parts, while keeping each in mind. Pencil and paper sketching lends itself well to both views, as the features of different degrees of closure and the variety of scales and levels of detail can be present on one sheet making it possible to switch focus easily.

### ***2. Provisionality.***

The particular qualities of a pencil mark suggest that a design is temporary. In other words, the rough, quick sketch encourages designers to postpone commitment and explore further their ideas. This postponement is connected with the lack of closure, low level of detail and relative imprecision that can be achieved.

### ***3. Switching.***

Pencil sketches allow a designer to switch between scales, between individual parts, levels of detail and different languages with ease and fluency. In this way, the capture of ideas is a fully iterative process. This seems similar to Hewson's idea of focus.

### ***4. Record keeping.***

Paper sketches, whether on the same sheet or on a series of sheets, inherently preserve all the workings of an idea. In this way, sketches not only record what has happened, they also trace the entire process. The act of rejecting a design with a simple stroke of a pen records an evaluation.

### ***5. Comparison***

Most of the features identified with pencil and paper sketches make it easy to compare any number of different solutions. This includes comparison of both two- and three-dimensional representations of any idea. The intentional or unintentional juxtaposition of sketches may lead to new ideas through associations. Hewson also makes the point that a number of sketches on one sheet makes it possible to keep all designs within our peripheral vision (the micro and macro visions I refer to above) and this in itself aids comparison. In addition, because of the ease with which we can rearrange separate sheets, we can re-position ideas which may in turn inspire new ones. Paper can also be torn and folded, thus extending the possibilities to compare and evaluate.

### ***6. Simulation of experience.***

Hewson introduces the term 'continuum of activity through continuity of medium' (1994: 88) to convey the point that the medium (paper) used for sketches is in certain respects the same as the final object. Paper allows a designer to flow from a sketch to a three-dimensional mock-up of the artefact being designed. While this is not strictly speaking a sketch, the medium allows a designer to manipulate it physically, enabling a direct experience.

Through pinpointing features and functions, which she supports with working sketches provided by practitioners, Hewson creates a coherent and convincing picture of how pencil and paper sketching facilitates the design of

text-based documents. However, while each component of her characterisation is clearly explained and evidenced, the connections between the features and functions are less well depicted. This became apparent when I attempted to organise her points in a systematic way. In short, some functions are very similar and many can be linked to several features. Hewson does modify her first characterisation, classifying features and functions in a different way, changing her terminology and adding extra subdivisions to provide a more nuanced picture. Although this amended version provides a more detailed picture of the role of traditional sketching, it loses clarity in its complexity. Therefore, I chose to combine aspects of each approach to create a distilled version that could clearly highlight the points relevant for my research, while minimising complication. My organisation of the material is shown here.

## **Features revealed by sketches**

- Visual features:**
- 1 - Characteristics of marks
  - 2 - Different scales (from thumbnail to actual size)
  - 3 - Degrees of closure
  - 4 - Amount of detail
  - 5 - Precision (closeness of sketch to printed object)
  - 6 - Mix of word and image (graphic image & written annotations)

- Other features:**
- 7 - Contain a number of sketches with different features on one sheet
  - 8 - Simulation of artefact - a sheet can be manipulated to create a mock-up of an object.

*These features combine to support the following functions:*

### **Functional aspects: Paper and pencil sketching offers:**

- *Provisionality*. The possibility for interpretation.  
Ambiguity. An idea is not fixed.
- *Focus*. The possibility of switching attention on different parts or whole, through differences in scale, degrees of closure, detail, range of languages.
- *Comparison*. Through close proximity and number of recorded sketches, there is possibility for ideas to be compared in a various ways.
- *Simulation of experience*. The possibility of physical manipulation to experience visual and haptic qualities through handling a 3D physical object.
- *Ideas capture*.
- *Record-keeping*.

### **Other functionalities**

- *Speed* that is appropriate (fast or slow). Also speed in which images can be rearranged and seen together.
- *Switching*, between scales, levels of detail and precision, different languages, and between sheets.
- *singularity of focus*. Vision and haptic senses are focused on the same surface.
- *richness of marks* (using same tool?)
- *Continuity* – a flow between sketches on paper and physical manipulation to simulate an artefact.

Some of Hewson's features and their functions are also available with digital media. For example, it is entirely possible to limit detail with digital tools, even if the tendency is to be more specific sooner than pencil and paper roughs encourage, and hard copies can be printed for making comparisons. Yet, there is a difference. This aside, I suggest that it is the features 6, 7 and 8 (i.e., multiple sketches, mixture of written and graphic language, and the ability to switch easily into a three-dimensional representation) that are significantly less easily replicated in the digital environment and this may have disadvantages. I argue that the functions that these features perform remain valuable for design process, as I now demonstrate.

### **3.3. Current design process**

To examine how the process of book design has been affected by the switch to digital technologies, I interviewed a selection of designers with a range of experiences and skills. The biographical details of the participants are covered on pages 33–34, in chapter one.

If pre-digital technologies had clear advantages over digital, it would be likely that their use would still be incorporated into current design process. Therefore, I first wanted to determine how much traditional tools were being used, and for what purpose. My interviewees show varying degrees of reliance on traditional sketching methods, indicating that in some cases paper and pencil methods still play a minor role in the beginning stages of a design. However, this is diminishing. David Jury works with both digital and letterpress technology, stating that he still uses pen and paper for both kinds of work, although he adds 'to be honest, less and less.' Simon Loxley, Geoff Green and Berenice Howard-Smith pretty much always start with paper, but their comments indicate this serves different purposes. Simon 'physically draw[s] out the page size' so that he can 'hold it' and get 'a physical sense of it', which links to Hewson's notion of simulation of experience. It also recalls a comment made by design educator Steve Rigley (2005: n.p) who stressed the importance of having a physical print-out which provides an opportunity 'to handle, to judge under differing light, to move around and fold, to mark, cut up and reconfigure.'



For Berenice, working with paper is a way of ‘working out where things go and what connects A to B to C’, akin to the idea of capturing essential elements first, while for Geoff, paper and pencil sketches provide the best way of gauging spatial relationships. Having designed books for around four decades, Geoff still designs ‘every book on paper’. He explains his first steps:

I get a piece of A4 paper out of the bin and I draw on the back the trim size and the margins. I always do it on paper first – I find it helps me to visualise those spaces far far easier than on screen. [...] The process of drawing out the margins with a ruler, marking out where the running heads are going to go [...] and where the running head sits [...] it’s far easier to do it on a bit of paper and work out where it sits in relation to the first line of text.

By contrast, Alistair Hall says ‘I work better straight onto a screen. When it comes to actually designing stuff I can visualise something so much clearer...’ Michael Mitchell, Charlotte Tate, Phil Treble and Dale Tomlinson similarly use a computer almost exclusively for the entire design process, suggesting that speed is the main advantage for them. Michael finds ‘it easier to do rapid sketches, using the computer’, while Phil explains ‘I’m so quick with the software and using the mouse I do it straight onto the computer.’ Dale shares this view, saying, ‘The ideas are so quick to execute.’

These comments indicate how the different features and functions of each medium are prized. Speed and ease predominate with digital tools, even though it is arguable that a quick, preliminary sketch on paper is still faster. Perhaps this reveals that the designers who see the process as being quicker to execute on screen are aiming for a higher level of detail or precision at the early stages, and these are undeniably faster achieved on screen than on paper.

The designers that instinctively work first on paper take advantage of the features and functions it provides. With reference to my interviewees, I highlight where ‘digital sketching’ matches the functionality of traditional practice, and the ways in which it falls short. In response to questions about their initial design processes, each designer describes their methods differently. Dale uses the term ‘digital sketching’ to refer to his first stages. He says:

... this is where my digital sketching comes in – I just pull a block which is going to be my text block, and I will stand back from the screen and think okay, so that margin on the outside is right, bottom one is okay, so very quickly I'll establish my text block area.

He goes further:

... you're messing around digitally on screen, but you started out with an idea that this has got to be ... a caps design, maybe centred, maybe evoke a period of time, therefore in this typeface. Those thoughts come in very quickly, so you might just open a blank document, size the book, look on the font list, [think] yeah, this is roughly [right], something like Caslon would do. You draft it in that, then open up a palette of colours and add a background, it just builds up like that.

Dale's process is comparable with the kind of quick, imprecise sketching that designers would carry out on paper, perhaps drawing a rough rectangle to indicate a text area and its position within the page. Yet, there is one notable difference: Dale's 'sketching' happens on one document rather than across a range of sheets as would more likely happen with paper and pencil, demonstrating a process that follows more of a 'draw and then modify' principle. (Bilda and Demirkan, 2003: 49.) Dale tells me how he makes use of the magnifying tool—'constantly in and out'—indicating that he switches between parts and the whole, showing a change in focus, but only one concept is in vision at one time.

Designer Berenice Howard-Smith is quite sure that traditional sketching leads her to explore more options at the first stage. She reflects 'With pen and paper I would probably say I go through more ideas – many more ideas.' Her degree of preliminary exploration is extended with traditional tools.

Charlotte Tate, who designs mostly on screen, acknowledges that 'for more complicated pages, it's more of a scribble down first.' She explains her reasons for this:

It's a way of being able to get lots of ideas out very very quickly. When you go straight onto computer [...] it takes longer [...] whereas with pen and paper you can scribble it down and get an idea of what your basic layout is, where text can go very quickly. It's an easier process I think being able to go straight from you head straight onto something rather than taking it from your mind on to the computer and then chopping and changing a bit.

The comments of both designers are in line with Hewson's conclusion that paper and pencil methods encourage multiple sketches. What is not clear is whether the proximity of different ideas, different scales and different parts of a design for evaluation, lead to better outcomes, but these are questions that are outside the scope of this study. However, in terms of an exploration of initial ideas and the ease of comparison, working only with digital tools appears to have shortcomings.

Degrees of closure and the corresponding sense of provisionality are important for design as it discourages fixing on an idea too quickly. This is an advantage that is less evident with digital sketching. If provisionality encourages the postponement of a conclusion, by extension, the precision of a digital 'rough' can lead us to pin down a solution without exploring other options. David Pearson is aware of this danger:

There is this instant gratification you get when you design on a screen which stops you from thinking. And ultimately with what we do, you need to put yourself in a position where you are thinking and doing. And sometimes computers steal that from you.

Susan Wightman concurs: 'What you are seeing on the computer looks so close to a finished thing, that I think it would be easy to produce a page of type and carry on going. The thing that stops you from doing that is printing it out.'

When Dale Tomlinson describes his process, his language suggests that his digital sketches function as preliminary. His choice of words such as 'messing around', 'draft' and 'muck about' suggest that he is capturing ideas rough-

ly at the early stage. However, at a later point in our discussion, Dale asserts the advantages of working digitally: ‘Straight on screen, it’s done instantly. It’s done perfectly as well.’ Here he demonstrates the degree of tautness of line and precision that happens almost straight away—reducing a semblance of ambiguity.

Alistair Hall is another designer who rarely makes use of paper sketching, advocating the benefits for himself of an entirely digital process. Yet, in agreement with Susan and David above, he also acknowledges the particular risk with digital: ‘I think there is a seduction in the computer screen that can be misleading because you can think ah, I’ve done it because it looks complete already...’

This doesn’t tell the whole story. Alistair also puts a counter argument. ‘I know when I’m doing that stuff on screen, even though it may look shiny it is still just an idea.’ Likewise, Phil always uses ‘the computer as a design tool in effect’ but also mentions that he sees this as a rough ‘even though it may look very finished.’ Yet, even if designers consider these stages to be ‘just an idea’, the very formality of the marks tends to give a digital sketch greater precision, thus reducing its quality of ambiguity and interpretability. This has consequences. A more scientific study conducted by architectural researchers Zafer Bilda and Halime Demirkan in 2003 revealed a difference with traditional sketching. They investigated differences in process at the concept-design stages for interior designers and found that when designers used pencil and paper rather than their digital drawing software, ‘designers’ goals and intentions more frequently changed in traditional media’, (Bilda and Demirkan, 2003: 48) which they partly link to ‘the ambiguous nature of sketches’ (:48). An earlier study by Suwa and Tversky, (2002, cited in Brew, Fava and Kantrowitz and 2012: 83) also found that when architects sketch, they look for a coherence of ideas and create different interpretations from the possibilities opened up by the ambiguity of their work. Although in both cases the research focused on a different design discipline, their findings are akin to Hewson’s concept of closure. However, it is still important to take into account Alistair Hall’s point. He believes that digital sketching makes him more versatile. While acknowledging that the screen can lead to a premature sense

of finish, he reflects ‘equally it allows a flexibility to the design process that I wouldn’t have with a pen and paper in certain instances.’ This is partly because he considers himself to have inadequate drawing skills, which again implies that he is expecting a level of aptitude for detail at the early sketching stage.

Unlike Dale and Alistair, David Jury finds it important to sketch things out on paper first. His reflection reveals how he switches scale, how his sketches lack detail and how he takes advantage of the medium to mock up an artefact at this stage of the process. He demonstrates how he switches between the different technologies, instinctively using each for what it does most efficiently and effectively. He describes this well:

Sometimes small scale, but I’ll end up doing that actual size – on paper, folding paper, and then when it comes to the detail, how many words will fit in this column, I will end up going to the computer and working things out in detail .... a lot of the planning is with drawing.

Both in his design work and in his teaching work, Simon Loxley has much in common with David. He describes his process as follows:

I say to students who are doing a book, my starting point is to actually physically draw out the size of the page on paper and then draw out where you think you might like the margins, hold it, and things like that.

Both David and Simon show how they harness the physical attributes of paper to simulate an artefact in a fluid manner that is a natural extension of their early design processes. In doing so, they imitate an experience, which further informs their design decisions. Most of my interviewees refer to the value of having something physical to experience. Simon makes this point unambiguously, commenting: ‘If it is something that is going to come out and be a physical object at the end, I think you need to have that connection from the start.’ Susan Wightman supports this with her comment: ‘I think that when

you are thinking about the format of the book, you want a dummy in your hand.’

While most designers appreciate the value of having tactile as well as visual perception, Simon acknowledges that this is less likely with digital tools. With regard to capturing first ideas on screen he states, ‘I suppose you can maintain it [the physical connection] by printing out things fairly early and laying them out and having a walk around it, which is a process that gets lost with digital...’

Simon’s comment leads back to another function that paper sketching can provide—one that Hewson alludes to in her category of ‘appropriate speed’. All of the features of the medium (multiple versions, switching of scale, the time taken to add more detail and precision) encourage us to deliberate. Simon compares the early processes of evaluating design ideas with fine art practice, reflecting on the value of contemplation. He explains, ‘it’s almost that fine art process – a lot of the most valuable time spent is not actually painting, but by staring at it and deciding what’s right or wrong and where you go.’ He suggests this can be incorporated into the digital process by printing things out at early stages and walking around them. Susan Wightman adopts this practice, commenting ‘[t]here is a case for saying that when you design something on the computer, you really have to print it out and look at it.’ This is partly to do with the more careful observations that this habit seems to generate. She also has the view that ‘Once you start printing things out then it’s almost like sketching by hand, and then you do lots of versions. So I don’t think it is so much using your hand as actually looking at physical bits of paper rather than looking at the screen that makes the difference.’ This suggests that she is at least partially aware of certain features of hand sketches and their functionality, and that she replicates these by turning her digital sketches into physical copies. This process will not reproduce the variety in scale, closure and precision perhaps, but it does allow for comparison through multiple sketches in close proximity. Even though she is referring to hard copies, as well as pointing to the different engagement this inculcates, she is making a connection between physical examples and the number of ideas.

Another feature of traditional media is that they invite us to combine different forms of notation on a single piece of paper. A designer can sketch with different degrees of detail and precision, can make written notes as reminders or in response to a visually expressed idea, and can make numerical calculations alongside. With digital sketching, we see a difference in the mixture of languages that designers use. At the time of our conversation, Phil Treble was running a letterpress studio alongside his digital design work. Although he exclusively uses his Mac for the early stages of his digital work, for the letterpress—work that he considers more ‘creative’—he reveals that he sometimes uses a sketchbook to capture ideas, combining visual and non-visual language. He explains that on occasions ‘If I have an idea I just write it down in there, and do a little sketch if the idea requires a certain amount of layout thought. I don’t tend to labour over the layout, it will just be an idea and then I will go to the computer to finesse that idea.’ For some reason, for the work he considers to be more creatively demanding, he reverts to non-digital media and combines written and visual language.

Alistair Hall also makes a relevant comment in this regard. He has a background in humanities as well as a design education, which may be why he regularly draws on words as a means of generating ideas. He describes his first design stages to me: ‘So, then there is note-taking at that stage, linguistic connected to visual ideas, but I won’t start drawing. I occasionally make tiny thumbnail sketches, but that’s at the stage I’ve generally thought about the ideas, then I switch to the computer.’

Alistair and Phil raise an additional point. A sketchbook can act as a way of working out concepts, but it can be more useful as a way of capturing an idea to protect it from being forgotten. This adds to Hewson’s list of functions performed by the features of paper and pencil and can be linked to theories of how we harness the external environment to help us think and remember. This is an area I explore with the theory of embodied cognition in chapter five.

There is one final, but not trivial function of paper sketching that is less evident with the use of digital tools. Hewson argues that when we use paper and pencil methods to capture and develop ideas, we have an automatic record of

our process. Alistair Hall describes this in terms of having a history, saying ‘[...] if you are working with a digital file you could go for hours work and then just do apple-all-delete and the screen looked the same as when you began. And I kept thinking if I’d done this on paper with a pencil then removed it, the history would record that process.’ While software allows us to revert to previous versions simply and store almost any number of them if we make the conscious effort to do so, this would slow down the process of working, removing one of the advantages of digital tools. But Alistair is referring more to the traces that pencil marks leave, even if an attempt has been made to erase them. With digital, in removing a record of our work, we also destroy anything that reveals our thought processes. Focusing on the links between drawing and thinking, researchers Brew, Fava and Kantrowitz (2012: 79). make a relevant point: ‘Drawing can be understood as the visible trace of our cognitive processes, the record of how we perceive, understand and process our experiences not just with our brains, but our hands and bodies as well.’ This is not something Hewson discusses, but is another aspect that is relevant to the changing design process, and is one that I pursue in Section II.

### **3.4. Concluding points**

Studies of the use of letterpress processes for design education and a study of traditional sketching with interior designers indicate that manual processes offer things that digital technologies lack. Rachel Hewson’s research into the use of paper and pencil sketching for typographic design led her to conclude that sketching is a powerful activity for designers and that ‘the qualities of the paper and pencil medium ... make it a particularly supportive medium for sketching’ (1994: 171). As digital technologies have shifted the process of book design almost entirely towards digital technology, from the capturing of ideas to the making of final, press-ready digital files, Hewson’s research provides a relevant basis from which to examine the negatives and positives of this change. Therefore, I have drawn on her characterisation of the features and functions associated with the paper medium to examine my data and, as a result, I have shown that some functions are lacking in the digital environment. Most notably, these are: the production of a range of initial ideas, the comparison of multiple sketches in close proximity, the ease to switch be-



tween graphic and non-graphic languages and the direct possibility to simulate experience. In addition, paper maintains records of our sketching stages as default and can be returned to with a different perspective. The data also suggest that, to a degree, book designers are aware of some differences and turn to traditional media intuitively in specific circumstances. However, this practice is diminishing.

I draw this chapter to a close with the conclusion that digital sketching is not a perfect substitute for its paper counterpart, but that the efficiencies of speed and precision bring designers sufficient compensation. In this chapter I have demonstrated the different possibilities that the two technologies offer in relation to their characteristics and have raised points which I refer back to in the section that follows. In Section II I look at theories from the fields of cognitive science and philosophy to find other ways of investigating design process in relation to the use of different technologies.



## SECTION II

### THEORETICAL FRAMEWORK AND RESEARCH DATA

In the first Section I provided a context for the research, outlining the activity of book design and the publishing system (past and present) in the light of recent technological change. I ascertained that the publishing system in the twenty-first century faces different challenges from those that arose in earlier centuries, and contested the idea that publishers are machines for content—a notion which devalues the importance of material qualities and the role of expert design. I also referred to existing design research which considers the advantages of manual processes such as letterpress and hand-sketching for design thinking, and showed how one particular study contributes to my investigation. I began with the argument that while research on design processes within the field adds to our understanding, it stops short of investigating how technology mediates and how the properties of different objects affect our thoughts and actions. In this section, I aim to address this by turning to disciplines such as philosophy and cognitive science, to extend our insights into the effects of digital technology on design process. This takes place over five chapters, opening with a discussion of philosophical approaches to technology which is essential to the topic of the thesis.



## Chapter 4. Understanding technology

*Technology is important in the history of the word not merely exteriorly, as a kind of circulator of pre-existing materials, but interiorly, for it transforms what can be said and what is said. Since writing came into existence, the evolution of the word and the evolution of consciousness have been intimately tied in with technologies and technological developments. Indeed, all major advances in consciousness depend on technological transformations and implementations of the word. (Ong, 1977: 42)*

In this chapter I set out some of the main issues surrounding technology—from what we understand technology to be, to the different ways technology is argued to have a mediating affect on human life. I discuss forms of technological mediation from selected viewpoints, and show how each can help reveal the influence of digital technologies on design process. The scholars I select span several decades and each brings a distinctive way of looking at how different technologies can influence design process. But, before we can consider the effects of technology, both intended and unintended, it is first necessary to know a little of its history as a subject of study. It is also essential to question what technology is, or what makes an object technological. This is by no means straightforward, as I discuss shortly.

### 4.1. Technology and philosophical enquiry

The understanding that there is a fundamental difference between natural and manmade objects is a long standing one, traceable back to the ancient Greeks, whose words ‘teckne’ and ‘logos’ are the origins of the word technology. However, our relationships with our manmade objects, and our comprehension of those relationships, has varied considerably over time. This is partly linked to technological advances themselves, which have in turn led to new ways of perceiving the world—in all its senses. For instance, the invention of telescopes altered not just what could be observed, but also our knowledge of

our environment and our view of our place within it. The scientific advances of the seventeenth century led to feelings of uncertainty and resistance—a state that Francis Bacon attempted to ease by giving a positive, philosophical view of technological change through his fictional work *New Atlantis*, published in 1627. More recently, innovations in digital technologies have created new uncertainties, alongside many positive opportunities. While technological change has always faced resistance (such as the early objections to printing mentioned in chapter two), today’s technology is giving rise to significant levels of criticism from many quarters and is generating countless questions about its repercussions.<sup>1</sup> The consequences of digital texts for the ways we write, read and comprehend, as well as for the forms in which we preserve and disseminate human knowledge are among the issues that are engaging scholars from different disciplines. Answers to these questions are clearly relevant for book design, but I suggest that investigations into most issues relating to the book could be enhanced by taking design more into account.

In the nineteenth century technology became a specific subject of philosophical thought, with the first reference to ‘philosophy of technology’ appearing in 1877 with the publication of Knapp’s *Grundlinien einer Philosophie der Technik*. (Nye, 2007). The early part of the twentieth century saw several contributions to discussion of the effects of technology, from Jacques Ellul’s way of understanding technology through its cultural impacts, to Walter Benjamin’s important explanation of how mechanical means of reproduction diminishes an ‘aura’ that surrounds a work of art, with implications for human perception and experience (Benjamin, 1935). Yet Professor of Philosophy Jan Kyrre Berg Olsen claims that it was not until 1953, when Martin Heidegger delivered his seminal lecture and subsequent essay on ‘The Question Concerning Technology’ that technology was properly ‘at the heart of philosophy’ (Olsen, 2009: 123). This turning point gave rise to the field of study that has experienced notable growth since the 1990s, most likely due to the diverse issues created by digitisation. Indeed, Diane Michelfelder (2010, 60–88)

<sup>1</sup>. For example, the implications of social media and digital-data ownership for democracy are recent areas of concern (e.g. Naughton, J. 2018).

charts the rise in philosophical inquiry into technology and attributes it to the stimulus created by recent technological innovations—innovations that she describes as having ‘a profound impact on shaping human existence’. Philosopher Evan Selinger appears to agree, pointing out that ‘new philosophical problems are being formulated as a result of analysts grappling with substantial technology induced changes to how people think, perceive, and act’ (Ralón, 2011). For philosophers drawn to the subject, Michelfelder notes the ‘sheer swarm of questions in play’ and also points to a corresponding increase in interdisciplinary inquiry into the topic (2010, 60–88). Both the spread of interest and the tendency for collaborative investigation is not surprising; digital technologies are not only pervasive, their very nature invites interconnectivity and the dissolution of boundaries, thereby encouraging more crossovers in research. Such possibilities—or affordances—offered by digitisation are significant in themselves and are the subject of chapter five.

It is clear that the philosophy of technology has developed substantially over the last 50 years, providing an important base for understanding how interactions with technologies affect our thoughts and actions. These insights are particularly important today for examining the profound impacts of digitisation and any consequences for the future. The theories I cover below are those I judge to be most applicable to my research topic: how digital technology has affected the process of book design. Before I turn to technological mediation, I first look at definitions of technology, in order to gain a clearer picture of the nature of technological objects.

## **4.2. Defining technology**

What is meant by the words technology and technological? In his book *Technology Matters*, historian David Nye asks if it is possible to define technology and, after tracing its meaning over time, he concludes that it ‘remains an unusually slippery term’ (Nye, 2007:15). If, as Nye asserts, technology matters, then we need to be able to discuss the topic from all angles, with minimal ambiguity. This requires a better picture of what technology is. While we have an idea of what the term means in an everyday context, we are challenged to explain convincingly what makes an object technological, or what technology encompasses. For instance, in what sense is a physical book a

technology rather than simply an artefact? Is an ebook different? Is a design tool simply a means to an end, or does it determine the outcome in ways that can be attributed to the mediating effects of technology?

Although the origins of the word technology are traceable to Ancient Greece, it only came into the English language in the 1600s (Nye, 2007). In the nineteenth century, German engineers adopted the term ‘technik’ to signify ‘the totality of tools, machines, systems and processes used in the practical arts and engineering’ (Nye, 2007: 12), but it was not until the twentieth century that the word technology came into regular use. At this point, definitions blended the meaning of ‘technik’ with an acknowledgement of the significance of technology for human development. For example, sociologist and philosopher Lewis Mumford described technology as ‘the sum total of systems of machines and techniques that underlie a civilisation’ (Nye, 2007: 13). While this may not matter for understanding design process, it certainly complicates how we can understand philosophical theories on technological mediation.

The difficulty in pinning down a universally accepted definition is partly caused by the diversity of contexts in which technology is studied or discussed. Editors working for the Society for the History of Technology (SHOT) confirm that definitions of technology vary across disciplines. They acknowledge that a common definition is ‘as the way that “things are done or made”’ (Long and Siddiqi, n.d.). The editors’ preferred definition is ‘the sum of the methods by which a social group provides itself with the material objects of their civilization’. They argue that the strength of this definition is that it is ‘not too confining’. The wish to avoid being restrictive is in some way an admission that technology is hard to specify. The many definitions that have been offered by various scholars confirm this to be the case. While some focus on tools and machinery, others focus on our interactions with them. Joseph Pitt, Professor of Philosophy and Editor-in-Chief of *Techné*, is not alone in his belief that technology is about the use of tools, not the tools themselves (Pitt, 2000). While Pitt unambiguously refers to the production of physical, tangible artefacts, his emphasis is clearly on the methods by which such objects are created and produced. Yet, if we use our hands to dig a hole to fill



with water, does it follow that our hands are a technological object? Nye manages to incorporate both objects and methods, adding a more concrete side to technologies. He states his firm belief that ‘technologies are not just objects but also the skills needed to use them’ (Nye, 2007: 4). Yet, even this seems unsatisfying if we seek a precise and comprehensive description. Philosopher Carl Mitcham perhaps provides the most succinct yet inclusive account of technology, which he defines as ‘the making and using of artefacts’ (Mitcham, 1994: 1). By employing the verbal nouns ‘making’ and ‘using’, Mitcham manages to communicate clearly a sense of active engagement with an artefact, covering its conception, construction and all manner of uses, whether intended or otherwise.

What is largely consistent in the range of definitions, is that technology does not exist independently of human use. In other words, a tree is not a technology, but if we use a twig to make a mark on a surface, the twig becomes technological by the fact that it is an object, or equipment, that advances civilisation. Yet, this still fails to inform us of what exactly makes an object technological in terms of how it affects us. An understanding of this is essential for investigating the use of digital tools for the making of a book, in whatever form. We need to ask, how do the tools we use influence design thinking, or process? Therefore, in order to define technology, rather than stating ‘technology is this’, it might be more useful to say ‘this particular thing is technology’, based on how it is capable of affecting us in its use. In other words, the question is what are the conditions that make anything—from a twig to a network of networks such as the internet—technological? To address this issue, I now turn to digital humanities scholar, Matthew Hayler, whose scrutiny of technology does exactly this, by examining the nature of our interactions with an object. By making a distinction between equipment, a device and a technology, I argue that he provides a clearer vision of technology, and that this provides a better starting point from which to investigate the impacts of all objects on the process of design.

### **Defining technology for the twenty-first century**

To make it possible to investigate resistance towards the use of e-readers, Hayler took on the challenge of first redefining technology. With his focus on

our encounters with new technologies, he set out to provide a definition ‘commensurate to the task of describing the intimate and very human encounter with equipment’ (Hayler, 2011: 2). Hayler first notes that with technology ‘there is nothing we can point to or touch, or describe consistent properties of [...]’ (Hayler, 2011: 26). This makes sense if we see a computer, for example, only as a technology when it is part of a process—that is, when it is being used by someone for a purpose. Yet, does this mean that, in certain circumstances, a computer can be classed as non-technological? This is the kind of problem that Hayler confronts. With a conviction that the nature of our interactions with objects is key to classifying something as technological, Hayler argues that existing definitions fall short. This deficiency lies in the lack of a word that makes explicit the way ‘equipment is inextricably interweaved with our existence and history’ (Hayler, 2011: 15). This is not a controversial idea, but he is right that definitions do not communicate this fully. By acknowledging that technology is not something that can be described without reference to its impact, Hayler’s perspective is necessary for furthering our understanding of its implications. It is certainly helpful for discussing the ways book designers interact with the technologies of their particular trade, as it foregrounds the idea that their use changes us fundamentally. This directly contradicts the view of type designer Fred Smeijers (1996), who asserts technology is something that happens around us, but not to us.

Working towards his definition, Hayler first tackles the more existential view of technology as unnatural, or as a force alienating us from our natural environment. His discussion exposes weaknesses in such arguments by making the point that when certain technologies have been assimilated, they become part of a natural scheme. This is central to his case. As an extension to this, I suggest that when we compare Cicero’s rather positive view of technology as allowing us to create a second nature (in Nye, 2007), with the later Romantic vision of a natural idyll where technology is thought of as an unnatural force, it is easy to see that our idea of the natural has been as much subject to change as our idea of technology. Curiously, digitisation may be shifting our views on both. By enabling us to become networked and connected temporally and spatially, mixing the virtual and the real, it has become harder to disentangle what we consider to be natural from other states. It is likely, or at least possible, that a lack of clear distinction between what is considered natural and

unnatural is at least partly responsible for the apparent resurgence of interest in analogue technology—that is, technologies that we have assimilated and, as Hayler argues, are therefore seen as natural. The printed book is a good example. As an object, it is so implicated in human evolution that it is easy to see it as the natural version of its unnatural, electronic form.

Hayler is thorough in his coverage and critique of existing meanings of technology. He expresses his dissatisfaction with the definition of technology as a system but asserts that the word technology itself is worth preserving. He explains the development of his definition by starting with a version which draws on the familiar idea of technology as a means to an end. He presents this as follows:

Technologies are the implements onto which we offload tasks in order to reduce our expense of time and effort .... Our interactions with such items are “technological”; a technology is an instance of an artefact with which we interact in order to accomplish something we could not by ourselves (Hayler, 2011, p.40).

Yet this, he argues, is inadequate. Instead, he calls for ‘[a] nuanced definition [that can] account for the experience of the knife and of the collider, to account for the initiate and expert use, and to recognise that each individual’s encounters are not of the same order’ (41). His point is that we must recognise the difference in abilities and skills that technological objects demand in their use, and that this variable is a factor that should be incorporated into definitions of technology. If we apply Hayler’s reasoning to the experience of a designer encountering the Mac, it allows us to see how the new tool is not technological in everyone’s hands. Book designer Dale Tomlinson recollects his early encounters with a Mac while working in-house. He explains that ‘even though the Mac was capable of doing [paste-up], there was nobody out there with those skills, and I didn’t have those skills.’ Without skilful interaction, the Mac’s presence was insufficient in itself to be technological.

Skill is not the only factor that Hayler includes. He argues that the use of equipment is central to the way we live in several ways: as an extension of our bodily and mental activity; as a way of perceiving the world, and as a way of

defining ourselves. For him, a suitable definition must be capable of expressing this essence. To achieve this, he presents a set of criteria which must be satisfied before a piece of equipment may be classed as technological. These four criteria need explanation, but in short they are labelled as extension, communality, incorporation and morphability. Taking each in turn I show how these lead to a distinction between a piece of equipment, a device and a technology. This distinction is useful for this thesis, as it provides the perspective of what technology does, rather than what technology is.

Hayler's first condition is that for an object to be technological, it must be able to extend human capabilities to accomplish a task. This is a familiar idea and not one that attracts much disagreement. Digital tools have certainly extended the capabilities of book designers. For example, through the combination of hardware and software, designers have greater capacity to manipulate photographic images, or create new ones with relative ease and speed. (How these possibilities influence design conceptualisation is discussed later.) Hayler pushes this idea further by describing how the availability of a technology alters our set of default practices; put differently, the equipment changes not just what we do, but also what we believe to be possible. This can be related to design practice. When the constraints change, everything shifts in a relative manner. For instance, if it becomes easy to achieve something that was previously difficult, that option becomes relatively more attractive. Given that book design involves finding optimal solutions within a set of constraints, this shift inevitably affects how we conceive a design. As one designer I interviewed explains with reference to his own work, with computer technology, creating a cover design from repeating patterns has become quick and easy, which encourages this kind of solution.

Once this criterion has been met, Hayler (47) argues that the equipment in question also needs to have 'a community of users' before it can be classed as technological. Showing some connection with philosopher Jacques Ellul's way of understanding technology through its cultural impacts, Hayler takes the idea that a technology consists of 'a blend of the material, the personal and the social as they affect a particular interaction' (47). If the 'personal' relates to individual skill, the social aspect he refers to here is the way in which cul-

tural forces lead to a skill becoming adopted by a wider group, and in this way the ability, or form of interaction, becomes well established in society through repeated action. This can be seen with the rapid spread of the use of Macintosh computers among typographic designers in the 1990s. Drawing again on Dale Tomlinson's recollection, we can see how the cultural forces were at play. He says 'It was something one had to get to grips with more and more, as outside designers started to say I can do that for you without a paste-up.'

On this point Hayler becomes more specific. He states that 'technologies exist only in extended webs of interaction by multiple parties, and part of encountering an artefact as a technology is the common experience of it as such' (49). He seems to be saying that a single person using one piece of equipment does not make that equipment technological. This leads to the logical conclusion that an individual interaction with a piece of equipment can be of a non-technological nature if it is an isolated act not transmitted to others. This is where his definition diverges more clearly from our more familiar ones. However, the fact that the process of printing with movable type spread so rapidly across Europe makes it a perfect example of technologies that satisfy all of Hayler's conditions. The same can be said of the computer and design software, which managed to supersede previous methods quickly by establishing a large 'community of users'.

The third criterion, incorporation, follows on naturally, as it focuses on the acquisition and development of skill. Drawing on the difference between novice use and expert use of a piece of equipment, Hayler questions whether each form of interaction should be treated similarly. His answer is that it should not, since the difference can be so great that inexpert use cannot be classed as being technological. This is compatible with the definitions put forward by many philosophers as mentioned above, i.e., that we cannot separate a technological object from human use. Hayler adds detail to this by attaching significance to the inconsistencies of such use. The concept of incorporation, therefore, provides a way of making a distinction between types of interaction measured by level of skill. When a user of a piece of equipment has become sufficiently adept to make such use automatic, or part of a person's body schema, then—and only then—can that interaction be described

as technological. By inference, the object can then be classed as technology. The kind of interaction he describes is similar to that which Heidegger (1954) refers to as ‘readiness-to-hand’, or what Andy Clark describes as ‘invisible-in-use’ (Clark, 2004: 28), but he takes it further by arguing that the artefact encountered by the inexperienced user is different from that which is encountered by an expert. We might say, therefore, that an artefact, as it is experienced, is not one and the same. This means that any attempt to ascertain the impacts of digital technologies must take into account the degree of incorporation. Singling out book designers, it is clear that their interaction with computer hardware and software, as a community of users, has become increasingly expert to the point where it is fully incorporated into their practice and process. With the digital environment, this incorporation can bring its own hazards. As Berenice Howard-Smith indicates: ‘[...] you can do things very much by rote, unless you are really careful.’

This brings me to Hayler’s final condition—morphability. This is the term he assigns to his idea that for an object to be classed as technological, it must be capable of transforming its user, not just behaviourally, but also physically through changes in our neural structures (Hayler, 2011: 66). In making this claim, he unambiguously asserts that technology—by definition—alters us. By including this feature, Hayler provides a link between what makes something technological and the theories of technological mediation that are offered by philosophers. He puts forward his own examples of the kinds of transformation that can take place, beginning with human boundaries, or limitations. Technology (satisfying his previous three conditions) changes our perception of what we believe to be achievable. Here, we might again use the example of the telescope, without which we might not have believed it possible to travel to the moon. Second, and more controversially, he anticipates physical changes that can occur through the repeated use of equipment. As mentioned above, this can also include complex, neurological changes that can take place within the human brain. Although Hayler was writing in 2011, he touches on the possibility of digital technologies affecting how and what we remember. Since then, research in this area has developed and evidence is emerging of a change in our ability to recall, or what we convert into long-term memory as a result of this technological shift (Coughlan, 2015).

The notion of morphability raises a minor point, but one worthy of note. While Hayler makes it an essential condition of technology, this is already implicit in the previous condition of incorporation. Given his assertion that the effects of incorporation ‘must be met by a physical change in the brain’ (66), if the first three conditions are met, then the fourth must also be met. However, it is a useful point to emphasise, not least because by specifying its transformative nature, or power, he insists that technology—by his definition—affects us both physiologically and cognitively. It is not just our actions that are changed by technology, it is also the way we think. Bringing his argument back to the question of how the tools used change the process of book design, it follows that once designers acquired sufficient skill to use computers to design a book, their processes were necessarily affected.

In summary, then, Hayler’s way of evaluating an object is not to find particular qualities within objects, but within our interactions with them. This fits with other definitions, yet it also forces us to re-categorise objects that we might be inclined to describe as technological. To follow his argument, a computer or a pencil (or even a book) is not a technology until its usage becomes sufficiently widespread and sufficiently skilful to become second nature, or in a sense, natural. This raises the idea that older technologies can become non-technological if the collective know-how is lost. This could apply to metal type, which could become a mere ornamental object, or even a fishing-line weight, if the ability to compose type is not transmitted. Hayler recognises that this leaves us with the need for a term that can adequately describe objects that fail to meet his conditions. By using the term ‘device’ to denote a useable object that he cannot class as technology, he fills this void. He makes this more acceptable by explaining that distinguishing between a technological object and a device does not create mutually exclusive sets because, for instance, the process of incorporation happens over time. Our interaction with a device can become technological and, as he argues, ‘all technologies must begin as devices’ (71). This is a plausible and logical conclusion to his case and describes well how book designers responded to the Mac when they first encountered it. Revisiting Dale Tomlinson’s comments once more provides an example of how change occurs. He explains:



[...] it crept up on me and a guy turned up at the Press from another company [...] and we learned a bit from him, and another younger designer came in, and slowly we all got to learn a bit about it. But I don't think I designed a book on a Mac from start to finish until I'd gone freelance [...].

As the community of users grew, skills could be transferred speeding up the process by which the device became the industry-standard technology. At the same time, the system for passing on know-how with respect to older technologies was lost.

Through his new definition Hayler eliminates the need for ambiguous terms such as 'technological systems' and gives us a more determinate way of thinking about the artefacts we surround ourselves with—one that I would argue is necessary if we are to conduct the kind of critical debate about technologies that many believe has been lacking. Thinking about what technology is not, as well as what it is, makes it possible to unpick its effects and I suggest that this is Hayler's most significant contribution to the field. His contribution to this thesis is to draw particular attention to the distinction between an object and a technological one and, by adding the concepts of incorporation and morphability, Hayler's thinking provides a clearer basis for looking at philosophical perspectives on technology, and to determine which elements of these can be best applied to book design process. However, although the view of technology as interaction, rather than an object independent of human use is sound, I have one point of departure. Hayler's definition focuses on the type of interaction we have with equipment as a way of classifying objects, excluding the effects of material properties. He is aware of this, and describes his view as 'agnostic to materiality' (83). I follow his logic, but suggest there is a need to consider the material aspects of a technological object to explain how its physical presence influences the forms that our interactions take. I argue that whether we use a pen to write or draw, or a mechanical typewriter, or a computer mouse and keyboard, our actions and thoughts are affected by the material characteristics of each tool. In addition, not all objects are technological—and Hayler makes it easier to make sensible distinctions—but all objects mediate in some way, even if they do not do so in the technological



ways that Hayler describes. This is explained by the concept of Affordance, which argues that the surface properties of objects also affect action, and is an area I explore in chapter five.

### **4.3. Technological mediation and a turn towards the material**

If morphability denotes the transformational capacities of technological objects through our interactions, then it is a natural step to want to understand what those transformations are and how they occur. This falls into several domains, including neuroscience, which uses imaging technology to study physical changes in the brain. One well-known study revealed that the enlarged hippocampi (dealing with memory and spatial navigation) typically seen in London taxi drivers, reduced in size with the switch to GPS mapping systems (Carr, 2010). Importantly, it is also a domain of philosophers, and several theories on how technology affects our actions and thoughts have emerged since Heidegger first raised the status of technology as a specific area of enquiry.

A full account of all such theories is beyond the scope of this thesis, although some background is useful. The following section therefore has two objectives: the first is to describe the philosophical scene; the second is to outline the theories that I consider most relevant and to show what they can reveal about the way digital tools shape the activity of book design.

Technology is no longer considered to be neutral, but not all technologies are transformative in the same ways, or to the same degree. We are beginning to see that the effects of digital technologies are of a different order from those associated with earlier technological advances, and there are unforeseen changes that may not be apparent for decades. New realms of virtual reality, networking capabilities, the developments in artificial intelligence and communication through social media platforms based on algorithms are significantly changing our relationships with our environment, with ourselves, and with each other. While these are not simple to gauge, the increase in available stimuli (perceptual overload) appears to be having an impact on our ability to select what to attend to. In addition, the mechanisms of scrolling on a screen

and a reduction in an ability to sustain attention, appears to be changing how we read (Wolf, 2008; Mangen, 2016; Camargo, 2016).

It may not be accidental that a change in philosophical approaches to the study of technology has coincided with the use of digital technologies. It is striking that much of the recent addition to the field has come from researchers connected with departments of Science and Technology Studies (STS) alongside those from the departments of Philosophy, thereby bringing new perspectives. In his study of the history of technological enquiry, Carl Mitcham (1994) picks up on this shift, drawing a distinction between a philosophy of technology typically generated from within the humanities, and the emergence of one that has more affinity with the world-views found within engineering and science. This has led to a turn towards empiricism and materiality or, as described by Ihde, ‘a sensitivity towards materiality’ (Olsen, Selinger and Riis, 2009: xi). Given that we are currently witnessing a trend towards an interest in material things and our relationships with physical artefacts, this seems to be a seasonable shift. I see this as a useful addition to Hayler’s thinking, and, with its foundations in the material qualities of the book and the value of interactions with physical media, it serves my own project well.

Following from this position, I concentrate on the work of philosophers that seek to understand technology with a ‘sensitivity’ towards material presence. In other words, I lean towards philosophers that view technological mediation as occurring through human interactions, while taking into account a technological object’s physical attributes. (Again, this provides a bridge to the theory of affordance which concentrates on the possibilities for action offered by the surface properties of objects of all kinds.) This approach is the bedrock of a philosophical position known as postphenomenology—a term which indicates a blend of phenomenology with pragmatism. To postphenomenologists such as Ihde and Verbeek, the idea of technology as being concrete refers to the way it can be studied as something in itself and with which we interact. This is not at odds with Hayler’s conditions of technology, which focuses on interactions, but it prevents us from ignoring how material, tangible qualities also influence how we interact. As noted in chapter three, for a

designer developing an idea, the physical nature of paper invites interaction of a kind that is different from what is invited by the screen. As designer David Jury notes too, the physical nature of metal type leads him to be more mentally engaged: ‘When I walk into my letterpress studio and I open a drawer, you know you’ve got hours of effort – there’s physical effort – literally pulling things off and moving things around, you really do think before you do it.’

Regardless of their disciplinary backgrounds, there are questions that philosophers of technology typically ask. Ihde lists three areas common in his field. The first is concerned with how technological life is different from earlier technological societies; the second asks whether technology is inert, and the third leans more towards speculation about the future (Verbeek, 2005). Yet Lucas Introna (2011: n.p) takes a different line of enquiry. He starts from the conviction that technology is not inert, and asks ‘Does technology shape society or society shape technology, or both shape each other? What is the nature of this shaping? Is it in practices, in ways of thinking, or is it more fundamental?’ For my purpose, Introna gets to the heart of the matter. While my research data provides information about the design process of the individual rather than the wider society, his questions are more in line with my own: with respect to the process of book design, are digital technologies shaping the process? Are they transforming our ways of thinking as well as our actions? And if so, how? These questions are not fully answerable, but it is possible to go some way towards understanding the possible effects of digitisation on design process.

### **An overview of the philosophy of technology**

Although my focus is on more recent theories, it would be deficient to begin my discussion without brief reference to the contribution made by Heidegger. Although his work is notoriously complex and problematic, his views on technology raise points that I believe remain relevant, and his work permeates much current philosophical thought. This is particularly evident among the philosophers I have chosen to follow, as a critique of Heidegger’s argument is often a starting point for their own.

Importantly, Heidegger (1954) disputed the widely held notion that technological artefacts are merely neutral instruments created and used by human beings for the purpose of their prosperity. He challenged this by making a distinction between technology and the essence of technology. This essence, he argued, reveals the world to us in ways which lead us to perceive it simply in terms of raw materials ready to be exploited and controlled. By failing to grasp that we have also come to see ourselves in a similar way—i.e., as a resource—he concludes that humans have unknowingly restricted their capacity to think. The main point here is that by thinking first and foremost in terms of resources and how they can be used, we are led to think only of technological solutions to any problem. Søren Riis articulates Heidegger's point clearly: 'the basic assumption common to all technologies and the way in which they encourage us to reason is in terms of means, and ends and objects' (Riis, 2009: 131). Although this has been widely criticised, we should not dismiss it. The implication is that technologies limit rather than extend what we imagine can be done, simply by making us only technological in outlook. This presents a different picture from the one Hayler puts forward, which implies that technological objects expand rather than restrict what we believe to be possible. I argue that both are equally plausible for book design. On the one hand, design software enables us to execute creative ideas that may not have been possible before, but it also tends to invite solutions driven by what the software makes easy. My participant Simon Loxley thinks back to the 1990s and acknowledges that 'a lot of that stuff would have been very hard if not impossible to do before digital technology.' Yet he also states that 'A lot of design was and probably still is to some extent, software led.' The alternative process is to 'think of what you want to do and try and realise it.'

My youngest participant Charlotte Tate expresses a similar idea. She comments:

When it's in your head you can think actually I want it to look like this [...] I think when you go straight onto the computer you are restricted already by what's on the computer. When you do it on paper, it's a case of you just creating something and so you now need to find a way to make that a reality.

Heidegger has much to offer on the ways technology steers our thoughts and action, but I now wish to turn to the philosophical work of Borgmann, Ihde and Verbeek. Albert Borgmann's theory of the device paradigm is of particular relevance. His argument is based on the premise that human interaction with the environment is shaped by objects, but he considers that it is the particular nature, or essence of these objects that is important. Technology, Borgmann (1984: 3) theorises, provides a 'characteristic and constraining pattern to the entire fabric of our lives' and it is this pattern, or paradigm, that he examines. To identify the pattern, he makes a distinction between the technologies he calls devices and those he considers to be things. Whereas a thing, according to Borgmann, engages us in its use, a 'device' fosters disengagement through its way of making something available by working in the background, and therefore requiring us to have limited understanding of it. He illustrates the difference by comparing a wood fire and a central heating system, where the former requires actions and generates engagement (arranging and lighting wood, sensing the changes) in contrast with the automated system which requires neither understanding nor thought. The implication here is that when we do not fully comprehend how our devices work, we develop a disconnection, which reduces our ability to comprehend the world at large and to respond to it with a lasting commitment (Borgmann, 1984). By comparison, a thing demands engagement through the practices, activities and context in which it is embedded. This difference in engagement comes across from the relationship that my participants have with their digital tools. With exceptions, designers reveal little understanding or interest in the programming that makes their tools function, as my interviewees tend to confirm. For example, in response to my question about the level of knowledge of how computers and software works, Geoff Green commented 'the only thing I've got an interest in is whether the [computer] works at 5 o'clock in the morning.' Experienced designer and letterpress printer David Jury offered an interesting and more in-depth response, revealing the difference in his engagement with different tools:

Well, one of the things I hate about digital is that I don't understand what it's doing. It does what I ask it to do, and design[ing] book for big publishers, you learn how to use the tools in an ap-

appropriate way, but I really hate not knowing what's happening inside the machine. [...] Whereas with letterpress you know exactly because you do it all yourself. I don't know how the little machine that turns the wheel – but when it comes to the amount of ink that goes on, I'm in control of everything and I resent bitterly not knowing how the computer works.

It is possible to interpret David's comments in the light of Borgmann's idea of engagement. Through understanding the mechanisms and through the practices that surround the work, such as applying the ink, letterpress technology encourages a particular physical and mental involvement. While all of my interviewees show appreciation for their digital tools, some admit that a form of disengagement can be fostered in their use. Book designer Berenice Howard-Smith reflects that it is sometimes hard to pay attention to her work on the Mac, and believes:

[...] you have to try very hard as a designer, I think perhaps more than other professions, you have to sit and think this is what I'm doing, I'm in the moment, my feet are on the floor and I'm sitting here doing this. Not wandering off [...] I've got to concentrate solely on this. That's quite hard. Because actually you can do things very much by rote, unless you are really careful.

With 'things' rather than 'devices'—using Borgmann's distinction—a mindful engagement is harder to avoid. Design educator Steve Rigley (2005) talks of the physical engagement that pre-digital technologies require, even if 'this was realised through carrying paper over to a lightbox'. The point being that carrying paper is akin to carrying wood to the fire, which demands engagement through the physical form of interaction it demands.

Borgmann concludes that a device which fosters disengagement also leads us only to consume (Verbeek, 2005: 178). This description of disengaged consumption as opposed to something that generates a more productive or even meaningful connection, might offer some explanation for why we have less attachment to books we read in electronic form, as research is revealing; once

again, this points to reasons for us to value the container as well as the content with respect to books and their design.

### **Things and an empirical turn: Postphenomenology**

The philosophical work of Ihde also proved relevant. Ihde's roots are in both hermeneutic and phenomenological traditions (where hermeneutics uses interpretation as its foundation and phenomenology stresses direct experience) and his questions centre on the role of technological objects in shaping human activity and experience. He is responsible for the term 'postphenomenology'—a philosophical approach to technology that blends hermeneutics and phenomenology with a form of pragmatism. In this way, Ihde combines acceptance of both subjective experience and the empirical world, or in other words, a belief in the subjective and objective, where each determines the other.

One of Ihde's contributions is to argue that technology is neither substantive (neutral) or instrumental (deterministic), but is a mediator. He explains this by comparing writing technologies such as a fountain pen and a typewriter. The pen encourages us to think slowly when composing sentences, while a typewriter speeds up composition and therefore fosters a different written style. A word-processor is different again and encourages another kind of writing; the internet and digital networks have generated other forms of writing, leading to its own field of research. The most striking point Ihde makes is that the mediating effect of the technologies does not rule out free will. If we chose to do so, as Verbeek points out, we are still able to write slowly using a typewriter. However, it is apparent that each tool can cultivate or engender a particular way to write (Verbeek, 2005). Applying this to the use of computers and design software, we could argue that designers can consciously counteract any mediating effect, if they so choose. However, to act consciously in this way requires an awareness of our working processes. One aim of this research is to create a greater awareness of the mediating effects of the tools we use, in order to foster more conscious choices.

Ihde (1990, 1991) offers several insightful ways of looking at technological mediation. One of those ways is to take perception and divide it into two



forms. The first he calls microperception, which Verbeek helpfully describes as ‘the bodily dimension of sensory perception’ (Verbeek, 2005: 122.) For example, information we can acquire about the weight and texture of paper through our haptic senses falls into this category. The second, macroperception, is described again by Verbeek as the ‘frameworks within which sensory perception take place’ (2005: 122). For Ihde, macroperception is classed as ‘cultural’, or ‘hermeneutic’ (Verbeek, 2005: 123), meaning that perception relies on interpretation, and that interpretation is culturally influenced. Following this line of thinking, we can argue that digital culture has changed the way we perceive printed books—especially those printed by letterpress—as we assign value to their sensory attributes in relation to books in electronic form. Crucially, Ihde argues, the different forms of perception cannot be separated from the other (1990, 1991). By describing perception in this way, Ihde draws specific attention to the role that our physical connection with objects plays in our understanding of the world, while also pointing to how that physical, sensory connection is interpreted differently according to cultural circumstances. Designer and letterpress printer Phil Treble alludes to this form of perception in relation to his own work. He explains one of his concerns: ‘I think .... that there is something about letterpress printing that bothers me in terms of people seeing it as a thing that you don’t want to touch or dirty.’ Similarly, designer Susan Wightman notes how certain manual skills are revered in comparison with what can be created digitally. She states:

[...] because the technical ability to do these things is now available to everyone, it’s almost as if people who do these things professionally are ... people have less respect for the expertise because it doesn’t involve hands kills. Whereas if you could draw and do things with your hands, people would say I can’t do that I’ll leave that to you. Now, because everyone can fiddle around with type on their computers, they don’t really understand the difference between when it’s done well and when it’s not done well.

Ihde contributes other ways of looking at technological mediation, all of which keep the concrete object in mind. But it is the philosopher Peter-Paul Verbeek who builds on Ihde’s postphenomenological viewpoint, addressing



more directly how technological objects mediate human action and perception. If Ihde acknowledges the material aspects of technology, Verbeek makes these more central, stating that to understand how technologies mediate our relationship with the world, we must analyse them in terms of their ‘concrete presence and reality...’ (Verbeek, 2005: 9). This makes sense if we take the view that objects of all kinds have an effect that emanates from their material presence—an argument that threads through this thesis, and which I develop in later chapters. But it is not just Verbeek’s focus on physicality that appeals; it is also the way he uses his version of postphenomenology as a methodology in itself. By focusing on what things do, he examines artefacts from our experience of using them, giving his philosophy a clear, practical application.

Verbeek explains and defends postphenomenology by critiquing the limits and advantages of both hermeneutics and phenomenology, and from this position he articulates his views on the role ‘technologies play in human existence and the relation between human beings and reality’ (Verbeek, 2005: 100). Put differently, we might say Verbeek finds a way to combine notions of objectivity and subjectivity. This shares some ground with Ihde’s idea of micro and macroperception, where subject and object are not just intertwined, but actively form each other. The phenomenologically inclined perspective illuminates how objects mediate by shaping our behaviour and the contexts in which we live; the hermeneutical perspective helps us understand how ‘objects mediate human experience by transforming perceptions and interpretive frameworks, shaping how humans encounter reality’ (Verbeek, 2005: 195). In short, postphenomenology provides a bridge between two often disconnected worlds, or a rejection of the dichotomy between subject and object, and between the worlds of science and human intention. Importantly, Verbeek argues that even though we accept that ‘things’ can only be understood as interpreted by humans, this does stop us reflecting on the role that ‘these contextual [...] constructions play concretely in the experience and behaviour of human beings’ (113).

So how does this advance our awareness of how our technological objects (or tools) actively mediate our actions and perceptions in the process of designing a book? There are several ways. First, we can see how computer hardware

and the desktop environment shape our behaviour simply by their material form. In-house designer Berenice Howard-Smith offers a direct view on the physical properties of the computer:

There is something about the mouse and the squareness of the screen, it constrains you somewhat. There is a physical feeling about that, that you don't get when you are not sat at a Mac. As much as I love Macs, there is something quite nice about sitting, even in a meeting, with a pen and you might just doodle something, and it's a nice fluidity to it.

Designer Simon Loxley points out the value of walking around and looking at physical copies of designs—an activity that is less likely to happen when he is looking at a screen. He reflects on the advantages of drawing on paper:

Then you get a physical sense already. If it is something that is going to come out and be a physical object at the end, I think you need to have that connection from the start. And I suppose you can maintain it by printing out things fairly early and laying them out and having a walk around it, which is a process that gets lost with digital [...]

Designer, printer and course leader David Jury is also aware of certain differences that come from the physical nature of different technologies. He states:

I like working in a small room with a computer and having everything going on on the screen. And it is wonderful to pick up images and just drop them in. But it's completely different from letterpress where it's – I do feel because of the physical moving around it's so much more healthy, or it's much more pleasurable.

This links to Verbeek's conclusions. By emphasising that mediation occurs through the material nature of objects, he can also conclude that the relationship between users of technology and the world around them happens 'at the sensorial level' (Verbeek, 2005: 209). The effects of technology are therefore

somewhat determined by its material, sensory properties. For the activity of book design, the qualities of the digital environment are clearly different from pre-digital ones.

In addition, digital tools change our perceptions by changing the frameworks from which we interpret what we see, feel, hear and so on. Working on a screen means that we have to interpret what we see, in order to visualise its relationship to a final, printed object. Essentially, we rely on our ability to read and interpret symbols. Type size, page dimensions, file locations are some examples of how the framework alters perception. Designer Alistair Hall alludes to this in one of his comments to me about working on screen:

[...] obviously because we design on screen it is more difficult to – you have to make a translation in your head to something physical to think how it's going to print, how is it going to over print, how are the colours going to look on a different paper, how that paper is going to move and shake, and even having a library of different stuff as a reference library to kind of go this helps me understand what this is going to be like, that's where when you are learning design if you are doing silk screen printing and etching and linocut – all that stuff is helping you understand the physical nature of things.

#### **4.4. Concluding points**

The purpose of this chapter has been to discuss some of the issues presented by defining technology and to set out ways that we can assess its mediating effects in relation to the process of book design. I began by looking at Hayler's approach to understanding what makes an object technological and found convincing arguments that technology cannot be considered independently from human interaction. In contrast with Hayler, I also argued that the material properties of technological objects is important for understanding their effects. While it is clear that how technology effects our thoughts and perceptions is complex, it can be soundly concluded that 'Artifacts transform experience' (Verbeek, 2005: 126).

In summary, the salient points from this chapter are as follows. Hayler's definition of technology, in conjunction with Verbeek's approach, provided me with a way of viewing technology from the position of what technology does. Hayler introduced the notion that different skill levels affect whether an object can be classed as technological, and therefore capable of affecting the way we think and act. This has direct links with the theory of affordance, which I discuss in the following chapter. Hayler also argued that a technological object can have different identities resulting from the different contexts in which they are used. From Borgmann, I found support for the idea of engagement and the characteristics of technological objects that foster disengagement. My interviewees provide concrete examples of Borgmann's ideas, and there are indications here that aspects of digital technology engage them less, mentally and physically. Most importantly, the work of Ihde and Verbeek provided me with a way to bring material qualities into the frame. Postphenomenology gives more emphasis to the physical, material properties of objects for an analysis of the mediating effects, and in this way, technologies can be understood to transform both our actions and behaviour, as well as our subjective experience. I also saw a natural link with the theories of affordance—i.e., possibilities that a thing or a technology offers, depending on our perceptions. I now turn to this concept.

## Chapter 5. Affordance

This section of the thesis opened with chapter four, where I showed that technological objects—by definition—alter us, and covered key philosophical approaches to the ways they mediate human actions and experience. From this perspective I looked at digital design processes by drawing on the accounts of practising book designers. It emerged that the physical qualities of technological objects are also implicated in that mediation. This leads me to the theory of affordance, which looks specifically at the surface, material properties of objects—technological and otherwise—and argues that these suggest courses of action. While affordance theory points out that the properties of objects invite certain actions, it also seeks to explain which possibilities we perceive and the factors that influence the interpretations we make. To make a simple distinction, whereas the philosophy of technology asks how our interactions with objects shape our actions and experiences, affordance theory focuses first on the material attributes of objects, and second, on how our physical and mental conditions affect what attributes and possibilities we perceive in an object. This could be seen as a switch in perspective from what things do to what we do.

To a degree, the theory of affordance anticipates the post-phenomenological approach developed by Ihde and Verbeek as discussed in the previous chapter, where subject and object are seen to co-determine each other. It also aligns with recent theories in the cognitive sciences, which claim that thought processes are inseparable from the external environment, as I set out in chapter six. These connections add to the argument that how we think, perceive and act is closely and intricately bound up with the objects, devices and technologies we create and use. For example, the printed book is a unique technological object (fulfilling Hayler's conditions) that offers many possibilities for action: not only does it have the potential to transmit and store information, evoke memory and act symbolically, its physical characteristics may also in-

vite us to prop open a door, or even burn for heat. What a book can afford should be a concern for book designers, just as much as the affordances of the tools they use to produce them.

In this chapter I review the concept of affordance and its developments, and show that our perception of possibilities is a function of material properties, contexts and individual circumstances. Importantly, an object's affordance can also be affected by bodily movement. Based on a range of literature, I relate the different insights and approaches to my research topic: the effects of digital technologies on book design processes and the possible consequences for the form of the book. I apply aspects of recent theory to my interview data, to look at design process from the perspective of possibilities for action. Specifically, I look for clues as to how the particular properties of digital technologies affect the ways we perceive and act in the context of design thinking. I conclude by summarising what this analysis suggests and indicate how it leads to the next chapter on new theories of cognition.

### **5.1. The theory of affordance: background and developments**

The concept of affordance is essentially a theory of perception. It was originally conceived by the psychologist J. J. Gibson, who developed the theory from his extensive study of visual perception and perceptual systems in relation to the interactions between human beings and their environment. Gibson first used the term affordance in his 1966 book *The Senses Considered as Perceptual Systems*, and developed the idea further in *The Ecological Approach to Visual Perception* (1979). He defined affordance in terms of possibilities for action, meaning that the physical, surface properties of things in the natural environment present or invite possibilities of use for a living being (Gibson, 1979). Since then, other definitions have emerged, widening the scope and versatility of the concept. For instance, Philosopher Zradko Radman (2013: xi) describes affordance as 'the immediate registration of an object's potential for interaction'. Sociologist Harvey Molotch (2011: 103) defines affordance as 'the capacity of an object to help people do something by virtue of its interface features—how it invites and facilitates some particular

action.’ From a more scientific background, Stoffregen and Mantel (2015: 257) emphasise the role of conscious intention in their claim that affordance is ‘something that people do, rather than something that happens to them.’ All definitions carry aspects of Gibson’s original idea, while adding to it.

Affordance, then, is not a new term, but the concept is gaining more attention for its relevance for several areas of contemporary research. Notably, it is particularly useful for the fields of product design, engineering and human–computer interaction (HCI) where the ways we interact with objects and how they can be manipulated, is a key issue. As an example, combining his backgrounds in computer science, engineering and psychology, Don Norman (1998) uses a version of the concept to argue for more user-centred product design that prioritises how we respond to particular features. Closer to the field of book design, literature scholar Heather MacFadyen (2011) also adopts the term for her work on digital books, to support her argument that the existence of ebooks accessed through various devices has served to highlight the distinct affordances of print books. By focusing on the properties of objects and human perception, affordance provides insights into how the things we encounter invite us to act in certain ways. This is of course applicable to digital technologies, and how the possibilities they offer influence the process of book design.

To understand affordance, it is helpful to begin with how it was originally conceived. Gibson’s interest in perception was in essence connected with the interrelationships of mind, body, and external world, and in this, he shared ground with his contemporary, the phenomenologist Merleau-Ponty.<sup>1</sup> Central to his argument is the idea that the natural environment offers, or ‘provides or furnishes’ (Gibson, 1979: 127), possibilities for action for animals and hu-

<sup>1</sup>. Merleau-Ponty was a French phenomenologist who concentrated on the body and perception as the main way of knowing. He saw a relationship between the mind and the body, and between the experienced and objective worlds. For more explanation, see Flynn, B., 2011.

<sup>2</sup>. Direct perception is a form of perception that arises from a stimulus and exists independently of prior knowledge, memory or expectations.

mans, and that these possibilities exist to be directly perceived, with or without the presence of a living being.<sup>2</sup> To illustrate this form of direct perception, we can consider how a tree offers the possibility of shelter from sun by way of its physical characteristics, regardless of the presence, or any prior knowledge, of an observer.

My perspective differs from Gibson's in so far as my interest is in manmade objects rather than naturally occurring ones, and with indirect rather than direct perception. This is more in line with recent research, as I outline further on. More specifically, my attention is on how our individual perception of possibilities is related to our individual characteristics and circumstances, such as physical attributes, existing knowledge and cultural contexts. Severe forms of dyslexia, for example, may affect the possibilities that a printed book offers to anyone with such a condition, just as physical fitness might determine what possibilities are perceived when a person encounters a bicycle. Gibson takes a step in this direction by combining the view that while the opportunities offered by objects via their surface properties exist in an objective sense, those properties are also 'measured relative to the animal' (Gibson, 1979: 127) In other words, he asserts a difference between what is perceptible and what is actually perceived. He illustrates this by comparing the affordances of a high stool as perceived by an adult and a young child. For the adult, the stool invites sitting, but not for the child, whose height makes such an act out of range. In a similar vein, research conducted by experimental psychologists Krpan and Schall (2014) supports the claim that how we perceive affordances in the environment is a factor of our physical potential to carry out an action. Both pencil and paper, and design software offer different possibilities to different people, depending on their personal attributes.

Gibson elaborates on this point himself and concludes that affordances are neither subjective nor objective, but are perhaps both. He explains:

Affordances of the environment ... are in a sense objective, real, and physical, unlike values and meanings, which are often supposed to be subjective, phenomenal and mental. ... An affordance sits across the dichotomy of subjective-objective and helps us to



understand its inadequacy. It is equally a fact of environment and a fact of behaviour. (Gibson, 1979: 129.)

Again, this harks back to Verbeek's position on the material reality of technologies.

## **5.2. Affordance: material properties, skill, knowledge and intention**

### **Material properties**

To recap, affordance—taken at its simplest—declares that the surface properties of an object invite us to act in certain ways through the possibilities they present. While the concept has been expanded by other scholars to take into account additional influencing factors, there are ways in which the material attributes of objects suggest certain actions themselves. Pre-digital technology affords particular design activity, as book designer Dale Tomlinson astutely observes. Referring to the days of composition using metal type and letterpress printing processes, he describes book typography as inherently based on X and Y co-ordinates. The physical nature of hot and cold-metal composition and letterpress technology steered the design of a page, suggesting possibilities and imposing limits on the arrangement of textual and pictorial content. When a page had to be 'locked up' in a frame (chase), breaking a grid was technically difficult, as was making significant changes. Dale explains: 'Things really were a grid in the days of metal type and stuff. It was always worked out on that basis.' By contrast, digitisation does not have such physical characteristics and allows much greater degrees of freedom—at least freedom from certain material constraints. As Dale admits, he will happily break a grid to solve an immediate problem, or as he puts it, 'pulling a measure out just to make a line fit at the bottom.' Dale is not alone in wondering whether today's designers, with no background in pre-digital technology, will have a very different way of approaching and thinking about page layout and book typography. While layout software such as InDesign is modelled on typographic principles that have been acquired through centuries of book-making, the physical qualities of the technologies that have helped shape those principles do not exist with digital tools.

Design software has other properties with different affordances. A digital page is made up of digital bits, with arguably no concrete existence. With basic technical skill, the digital environment offers an observer almost infinite malleability of text and image, as well as the ability to experiment (and replicate) with near-zero material costs. Designer and educator Simon Loxley picks up on how this affects design. Reflecting on the early days of digital practice, he comments that ‘A lot of design was and probably still is to some extent, software led. You really saw that in the ’90s when people got hold of Photoshop and it was let’s see what Photoshop can do and then let’s do a design that exploits that.’ Similarly, graphic designer Alistair Hall remembers his student days at the end of the 1990s and refers to ‘all that layered photoshop nonsense [...]’, implying that the overuse of layers (‘twenty layers fading into each other and type you can’t read’) was due to the possibilities that the technology makes apparent, rather than a particular design vision. Part of the appeal of layering at that time arose from the fact that experimentation of this kind could not be easily or reliably achieved with previous technologies. Through its menus of options, Photoshop and other design programs invite users to manipulate image or type with little effort and constraint, which the physical limits of previous technologies had not facilitated. It is problematic to pinpoint surface properties of software and to compare them with those of physical tools, but software offers a range of possibilities for action nonetheless, all equally available and displayed as graphic or linguistic signs via the surface of a screen. In this way, the affordances of digital technology are appreciably different from other technologies.

It appears that hindsight has bestowed an understanding of our interactions with design software in its early days, at least at a superficial level. In response to a question about the possibilities offered by digital software, in-house designer Berenice Howard-Smith contributes the following:

I’ve not considered that before. But I suppose they do [invite actions] [...] Even if you went down the basics of the tutorial videos, the promotional stuff and everything that pops up around using the software, then yes, there is the power of suggestion there and the temptation to muck about with tools that maybe you

shouldn't! I'm thinking of tracking and kerning and things. ....  
They offer a lot of power of suggestion to people [...]

Berenice implies that she does not think about the possibilities digital tools and how these might shape her decisions. I suspect this is not a unique position for book designers. By drawing on the concept of affordance, I intend to raise appreciation of our perception of the possibilities offered by different design tools and the consequences for the process of design. For book designers, having a greater awareness of how objects (technological or otherwise) influence the ways we think and act serves two purposes. First, it might encourage a more considered approach to the process and practice itself, increasing the range of ways we explore and develop ideas; second, it may bring attention to how the design of any book can influence its affordances. In other words, it might encourage thinking about the importance of the material properties of a book in terms of what actions these attributes can invite. For example, weight and dimensions may afford portability, while wider page margins may invite readers to make annotations to record or develop thoughts as they read.

## **Skills**

Gibson acknowledged how physical attributes affect our perception of what an object affords, but did not include skills and knowledge in his theory. He made it clear that surface properties invite actions—paper offers the opportunity to be folded—but in practice, the possibilities we perceive when we encounter an object are influenced by many factors, including our existing skills and prior knowledge. If we have mastered the art of writing, paper also offers a surface for note-making. To the illiterate, a textbook may suggest use as a flat surface, or as an object help reach something, but it offers little in the way of learning. Of course, the skills we develop may be related to our physical characteristics. For instance, an ability to catch a ball is related to hand–eye coordination, but skills and knowledge are also a function of education and social or cultural circumstances. It is logical to extend Gibson's line of argument to say that affordances are not just perceived relative to physical attributes, but are also relational to individual skill sets, knowledge, cultural contexts and intentions or needs.

For their research into workplace experience, Mackenzie, Marks and Morgan (2015: 736) make a strong case for their claim that how we perceive affordance should be extended ‘to include capacity due to knowledge or skill.’ To support their point, they compare the use of a computer by people with varying abilities: for a typical user, it may afford the possibility of word processing, while for a computer scientist, affordances include coding and programming. Again, this illustrates how the possibilities of an object become more or less apparent according to the existing skills of an observer. This is somewhat demonstrated by two of my interviewees. Both designers describe their drawing skills as poor and explain that design software enables them to do things that their lack of drawing skills would otherwise prevent. Designer Alistair Hall describes himself as having ‘a basic inability to draw lettering’, adding ‘it’s something I couldn’t do! [...] So for me I work much better looking at a thing working onto a computer.’ Similarly, David Pearson—a designer renowned for his highly successful book covers, states: ‘I can’t draw, and I’m terrified of cropping photos. So I tend to avoid all of those things, and what that leaves you with is the ability to make pictures out of type’ (see figure 4). Making pictures out of type is one particular affordance of digital software, because of the ease with which we can manipulate type in its digital, non-tangible form. Once basic computer skills have been acquired, the software undeniably presents opportunities that the properties of metal or photo-composition could not offer.

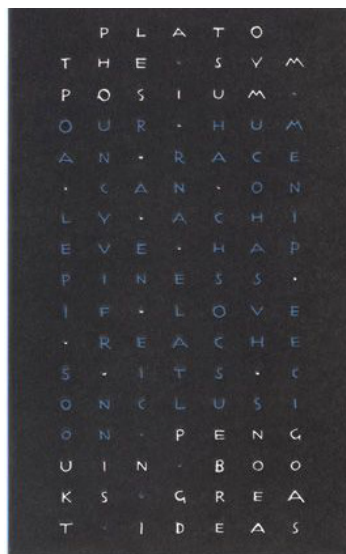


Figure 4: Book cover designed by David Pearson, 1999.

Pearson, D., 1999. Plato, *The symposium*. [Image online] London: Penguin.

Available at: <https://www.penguin.co.uk/search-results.html?q=the+symposium%2C+great+ideas>

We know that the switch from more manual processes to digital processes has led to the acquisition of new skills for the process of book design. It has also changed the kind of knowledge that is required and acquired. The hand skills required for detailed hand-lettering and for cutting accurately with scalpels are no longer part of the process. Instead, different motor skills are needed to operate computer hardware and software. The activities of mark-making, measuring and scaling images by manipulating physical tools have been superseded by the activities of clicking, pointing and dragging. With digital tools, at the early stages of design, type can be ‘rendered’ precisely and near-instantly with a few clicks, and alternatives can be tried just as quickly. As Dale Tomlinson notes: ‘Straight on screen, it’s done instantly. It’s done perfectly as well, because you can centre things with a click of a button.’ This could reduce the need for prior deliberation because it is easy to reject an idea. But it could also encourage a wider range of speculative attempts. However, the studies comparing the use of computer-aided design with hand drawing referred to in chapter three point to the opposite being the case.

In contrast to Dale’s description of working with digital technology, Geoff Green recounts the process of book design in the 1970s. It involved ‘[...] carefully drawn out letters on these layouts so that the line of caps with the headings were supposed to look like the type it was being set in, not something arbitrary.’ While the acquisition of a new skill need not lead to the degeneration of an existing one, such as the manual dexterity required for the careful hand-rendering that Geoff describes, it is likely to diminish with lack of practice. It is also less likely to be passed on tacitly to others. In itself, this is not necessarily a problem, but if affordance is relational to skill, then changes in skills will affect the possibilities for action that present themselves. This recalls Hayler’s point that for an object to become technological, it requires a community of users who have developed skilful use. It is easy to see how skill spreads from a few to the many, which affects the possibilities that we perceive. This is pertinent for comparing the affordances of old and new tools, as the skills required for one supersede the other. To the uninitiated, computers and design software offer little to someone encountering them for the first time, as designer Dale Tomlinson indicates when he thinks back to his first experience. He describes his first introduction to a Macintosh computer, recalling that it ‘just turned up one day’ and that ‘everyone was fascinated by

the fact you could draw squares and colour them in.’ But, without training, it was not useful. Looked at in terms of affordance, the computer itself—its surface properties alone—failed to suggest a use for the purpose of design. Skill was required before such possibilities were evident to an observer.

The use of the Mac and sophisticated design software has been widely assimilated by book designers. With sufficient skills, these digital tools afford a range of actions that are different from those afforded by their pre-digital counterparts. The properties of digital tools offer greater possibilities due to the reduction in physical constraints. Yet, if we take only the surface, material properties, computer hardware arguably imposes more limitations, offering fewer possibilities. The screen constrains by its physical size, and the mouse (and even a digital pen) offers relatively limited movement. However, with knowledge and skill, the perception of possibilities extends beyond surface properties, and as a result, digital tools are not considered limited. Alistair Hall expresses his sense of the opportunities offered by digitisation, while also hinting at the value of restrictions. Making comparison with earlier technologies, he states:

[...] there’s a thing about truth in materials and that I guess with something printed, or something solid, you go, it is what it is because of the form of production, so a bit of woodblock will print in a particular way because the ink hits the block in a particular way and it transfers to the paper in a particular way, and all those things are real and definite because of their physical nature. You can tweak them but only with other physical things. Whereas with the computer those limits aren’t there. [...] I guess at the output stage that it defines some limits, but everything else is up for grabs within the possibilities of that bit of software. [...] You’re kind of lost in this big desert of creative possibility that you don’t know how to anchor yourself.

This implies that constraints can have a positive effect on creativity. Alistair thinks so, reflecting that ‘once you start to limit the possibilities, you are

forced to be more creative within certain parameters.’ Simon Loxley expresses a similar view, noting that a particular problem with digital ‘can be the lack of constraints. Because what you can do with ease is so vast, sometimes you could be reigning yourself in.’

It is as though the digital environment suggests that anything is possible, because possibilities for action are not defined or suggested in relation to surface, physical characteristics. The intangible, unfixed nature of digital implies, or offers infinite options. David Murray—a software engineer with a background in mechanical engineering—made a noteworthy comment about digital versus physical materials. He explained to me that he was drawn towards software because of the potential to make or build anything without limits, and illustrated this by comparing it with the option to build a 250 mile-high tower with a swimming pool on the top, just because you can. He added that he sometimes wished he did have constraints with his work, and that with software, the possibilities can lead to an unnecessary level of over complexity (Murray, 2012). David’s points also relate to the design of a book, where the software invites anything but simplicity. Alistair’s recollection of design in the late ’90s acts as an example: ‘[...] all that layered photoshop nonsense [...] I’m going to have 20 layers fading into each other and type you can’t read and I remember not feeling comfortable with it because it was like doing a painting and not knowing when it’s stopping, when it’s done.’

Alistair picks up on another important point: with digital files, it can be hard to obtain a sense of an end. This is partly because the software offers so many possibilities for action with respect to design, but also partly because it provides the possibility to make infinitesimal adjustments, denying us the belief that nothing more can be done. I suspect that this lack of endpoint is also related to doubt. What we see on screen can feel less secure than what we see on physical paper. This is for at least two reasons: first, the whole is not necessarily visible, and second, with digital files it is easy to introduce a last-minute error. My interviewee Neil de Cort, who is in control of production at an academic publishing house, gives a perfect example:



The problem you get then is that in theory you say to the designer just change this comma or whatever, but then, I've had one recently where he inadvertently duplicated a bit of text in the middle of the author's bio. And of course, we checked the change had been made, but nothing else, and it got printed.

This also highlights how digital processes encourage us to postpone meticulous checking. Again, Neil de Cort's experience leads him to the view that digital processes change attention to detail. His comments apply to editors and proof-checkers, but can equally apply to designers: He says:

I suspect people think there will always be another point at which I can check this. Certainly in my experience, I give them a print out of a cover and say check this. I say this is going to press next week. They won't find anything. They get the sherpa back, and they think this is my last chance. And then they check it and then they find something.

The ability to postpone a decision is also encouraged in authors. Comparing past systems with digital ones, Neil explains:

There would be a point when we would say to the authors, this is done now. [...] I remember saying to people you can't make that change because this is imposed, on the film – this was four colour, so it wasn't quite the same thing – but we can't afford to run out all those pieces of film again, just because you want that comma added. We can do that now. So yes, there are definitely more changes made because we can make them. Because people in my position don't have to say, you can't do that anymore.

The material nature of the pre-digital processes not only invited certain actions, but they led to different psychological states. The materials in use, i.e. light-sensitive paper (bromide) and film, did not provide the possibility of making cost-free changes. This acted as an incentive to apply more care to getting things right at earlier stages.



## Knowledge

Prior knowledge also directly influences the possibilities we perceive when we encounter an object. Knowledge, as with abilities, may be both enabling and constraining in terms of affordance. David Jury draws on his observations of how his students work and compares their actions with his own. He reflects: ‘students are great in a way because they don’t know how type works and they just do crazy things sometimes.’ He contrasts this with his more informed process and suggests:

But if you know the way type was designed to be used, you tend to use it in that way. Students are often unaware of that and with digital it allows them to do anything they like anyway, so they just start squeezing, changing, doing all kinds of stuff with type. I have to say to students I’d rather you didn’t do that, but I usually say it with a smile. Okay, you do it if you want but I possibly couldn’t!

In this case, although the possibilities exist equally for David and his students in an objective sense, the possibilities for action present themselves differently. David’s historical knowledge of type and the practical knowledge he has acquired through working with physical forms and processes alters the way he responds to opportunities, with both positive and negative consequences. He talks of how his letterpress experience ‘helps you to know about type a lot more.’ But he also wonders if this limits his actions with the digital tools that he believes make it possible ‘to do anything’.

Computer technology also affords new possibilities for designers in the form of coding or programming, but only to those that have the knowledge (or skill) to carry this out. Claire Mason is a designer who recognises the possibilities of code for automating work. Speaking at the mini conference ‘Stories from the Fold’ at St Bride Library in September 2013, she referred to code and coding as ‘just another tool to shape text’. For Claire, then, the digital environment affords extra possibilities, yet most of my participants do not see the computer technology in this way. Alistair Hall states emphatically that he doesn’t have any idea about computer coding and asks ‘Do I need to under-

stand it?’ Simon Loxley states ‘... at the moment my interest in coding is not an area I think about’ and David Jury says he has little interest, but notes that ‘on the other hand, intellectually I think I should know about that.’ Given Bhaskar’s vision of future publishing houses populated by coders and software developers, it will be interesting to see if this outlook changes. Dale Tomlinson is one book design who appreciates the potential for understanding how to code for book design, and refers to his own way of customising certain software features for efficiency. He says ‘somebody who is a coding expert might tell me there are so many things you can do with coding. I’d go great, I’d love to find out.’ However, among my participants, he is the exception to the rule. In the main, my designers hold the opinion that this is knowledge and skill that would take too much time to acquire, for benefits that seem more related to automation and efficiency than creativity. This fits, however, with the idea that it is through the acquisition of knowledge and skills that more possibilities become apparent. This holds true for all technologies, but with digital, there appears to be a layer of possibilities for design that is somewhat opaque. This is in part because the surface properties themselves do not offer the possibility of coding, and the prior knowledge of computing needed to reveal them is not typical among book designers.

## **Intention**

So far, I have discussed how our physical attributes, existing skills and knowledge can affect our perception of what things afford, but there is one final factor affecting the perception of possibilities for action. Affordance is also a function of a person’s needs or intentions at a particular time. Gibson made the point that the surface properties of objects suggest possibilities to an observer, but objects—both naturally occurring and manmade—have several surface properties or qualities, any of which could invite certain actions. Which of these possibilities we discern is likely to be connected with a predetermined need or goal. Taking a printed book as an example, it is possible to see how the properties we perceive are affected by what we are looking for; if our purpose is research, text is likely to be the dominant characteristic; if we need warmth, the flammable properties of paper might predominate, and if we want to reach beyond our height, the book’s dimensions and the sturdiness of the materials will be what we notice. Yet, with aims and intentions, there is an

element of reciprocity: our intentions influence affordance and vice versa. When we encounter a class of objects such as ‘books’ the individual qualities matter to the way in which it might be used. If a book is small, it invites portability, but this may or may not be the possibility we had in mind. In the early days of book printing and publishing, Aldus Manutius was astute in recognising this particular affordance when he introduced books in octavo-format—a size that was perfectly suited for carrying in a pocket.<sup>3</sup> Similarly, Allen Lane’s paperbacks introduced in 1935 also invited portability by having covers made of lighter and more flexible material. In both cases, the material specifications of the book created their own possibilities for readers. For designers, such examples highlight the value of thinking in terms of affordance—not just in terms of how their tools invite them to act, but in terms of how their own designs might invite possibilities of use.

It is easy to grasp intuitively that any aim or intention we hold will affect what possibilities we perceive in an object. Most people will have experience of using an implement not designed for its intended purpose, such as using a broom to retrieve an object under a sofa. It is equally easy to understand that the properties of objects suggest possibilities for action before we have a need. This invites the question of which of these influences is dominant. In the case of digital design tools, we want to know the degree to which possibilities are perceived according to a designer’s pre-imagined ideas, as opposed to what the tools themselves present. Dale Tomlinson would argue that his intention steers his process, as he sees all tools as simply another ‘means to an end’, or as objects to facilitate achieving a predetermined goal. Yet, the case is strong for arguing that this is not so: technological mediation and affordances of design tools influence our actions, both through the many ways objects change our perception (technological mediation) or through the actions that their properties invite.

For intentions to take the lead in determining the perception of possibilities, I suggest that a goal needs to be well defined. If a designer interacts with tools

<sup>3</sup>. Octavo refers to the number of times a flat sheet is folded (in this case, to produce eight leaves), and therefore the exact size depends on the size of the sheet.

with a general aim, such as to design a cookery book, they are likely to perceive different possibilities from a designer who interacts with tools with the intention of executing a design already clearly imagined. I therefore propose that for the activity of design, the relationship between intention and affordance is a function of ability to visualise different ideas prior to the point when a designer engages with tools. I also suggest that this ability is developed, to an extent, through working with pre-digital processes. Digital processes allow and encourage us to offload more of our mental and physical labour to our tools (hardware and software). They also reduce the need for pre-planning (as the cost of making changes if a problem arises is significantly less), which in turn reduces the prior need for mentally picturing different options, in the light of anticipated complications. Although we may hold knowledge of typefaces that guides our choices, we do not need to recollect the details of a particular font, because we can browse a font menu and render text on screen to compare styles and sizes in an instant. It is logical to argue that an ability to visualise in any detail is developed or enhanced by processes that involve manual engagement and physical effort, which encourage us to observe detail more carefully. At the mini-conference at St Bride Library, Claire Mason (2013)—a designer with considerable experience of text design—talked about her experiences with both traditional and digital processes. She described her work for Penguin Books and the process of carefully producing templates with detailed written specifications. She concluded that this activity forces a designer to think everything through up front. Her comments lend weight to the suggestion that designers whose experience is limited to digital processes may respond more to the affordances of the tools, relying less on forethought and prior visualisation. My youngest participant, Charlotte Tate, acknowledges that her experience is different from older designers. She notes: ‘I’ve grown up with computers and [...] having a smart phone, and being able to constantly go to the internet. So my way of thinking has probably always been that type of access, in comparison with having to look something up physically.’ In reflecting on constraints, she reveals a difference between holding something in mind, and using the computer:

Well I guess when you [design] on a computer you are restricted to what fonts you have loaded up. You can only think what you’ve

got in the library, or have a search through to see what you've got. When it's in your head you can think actually I want it to look like this and then you go to the internet and have a look, which faces look like this, or how can I illustrate or draw it. I think when you go straight onto the computer you are restricted already by what's on the computer. When you do it on paper, it's a case of you just creating something and so you now need to find a way to make that a reality.

The capacity to think through ideas without the use of external objects is likely to be related to length of experience as well as breadth, although both appear to contribute to an inclination to visualise mentally. Susan Wightman compares past processes with today's predominantly digital ones, and concludes that 'some people have lost the ability to visualise how it is going to look.' Although she is mainly referring to editors who fail to anticipate the design consequences of their requests, her comments are more generally valid. As discussed above, the nature of digitisation affords changes to be made at late stages of the process, with little material cost. This reduces the pressure to think through details in advance of an action, which in Susan's experience means that 'the ability to visualise gets lost in the process somehow because it's not needed anymore.'

My interviews reveal how book designers differ in their initial, creative stages. For Dale Tomlinson, Geoff Green and Simon Loxley, their designs are often driven by a reasonably well-formed mental picture, while others hint more at a process of finding an idea by playing on screen. Simon—a designer with experience of different processes—works to a large extent in his head. He reflects:

As time has gone on I think a lot of designing I do in my head before I even do anything. [...] With experience you can probably decide if it might work. Then you come to it and it doesn't work! But with experience you can imagine what to do without much planning process by hand or by screen.

Dale is another one of my participants who is certain that he begins with a clear idea of what he is aiming for. For him, there is little need for much of an exploratory stage using either traditional or digital sketching, because he has already visualised what might work best. His comment on the difference between paper sketching and screen-work indicates how he engages his imagination in advance. He rejects the idea that designers need to sketch ideas out first and that they shouldn't 'go straight onto screen'. He exclaims 'Yes, you can! You just have to have a really good vivid imagination and know how to translate that straight onto the screen.' Dale refines his ideas on screen, but his description of his process reveals just how much he has already pre planned: '[...] you're messing around digitally on screen, but you started out with an idea that this has got to be a caps design, maybe centred, maybe evoke a period of time, therefore in this typeface.' He elaborates: 'Maybe three, four, five, maybe ten choices in my head.' For Dale, and any designer who sets out with a fairly well-formed mental picture to direct their actions, intention may be the most important factor in determining the possibilities he perceives. However, there is also indication that our intentions change in accordance with what an object or tool affords. This seems to be the case with design software in particular, with regards to the extent of opportunities it offers. While Dale's comments suggest that his engagement with digital tools is led by his mentally conceived ideas, or prior intentions, if we compare this with some of the comments made by other designers, a different process emerges. For example, Alistair Hall explains how 'you are at risk of creating something just because the technology allows it. I can cut and paste in repeat and rotate and scale, as much as I want and that's going to determine that bit of design.' Of course, this risk is also evident with traditional tools; any technology imposes particular conditions of use. Yet Alistair does pick up on a particular affordance of digital software. The ease with which certain operations can be carried out inevitably steers us towards particular actions, increasing the likelihood that it will lead a design concept. David Pearson's comments indicate how this can happen:

I do hundreds of these patterned book covers for a French publisher. The technology really leads that. If you create any pattern or something that's repeated, you are only having to draw one

element and then repeat it any number of times using the technology. You think I'm lucky to have this technology right now.

While David acknowledges that the 'technology really leads' here, and that he 'obviously lean[s] on the technology', he adds that 'in a way I don't feel like I do anything more using it.' This appears contradictory, yet it does seem that his actions are directly connected with the affordances of his digital environment.

There is one final affordance of digital technology that relates to both skill and intentions. In comparison with pre-digital technology, digital work offers quick results. This has a number of consequences that most of my participants pick up on. Simon Loxley mentions how students perceive the planning stages that traditional design process requires as being too time-consuming; yet planning was once considered an essential part of how book design is defined. The speed and the automation of certain tasks also has an impact on attention. Simon thinks the only downside of digital (compared with the preceding phototypesetting days) is the loss of 'that close looking ... that perhaps with the speed and demand of things being quicker and quicker with digital, they can be lost. ... And because you can turn things out very fast, [clients] just want things faster and faster, so a lot of that contemplation is lost.' With automation, Berenice is aware that she has to actively concentrate, saying 'That's quite hard. Because actually you can do things very much by rote, unless you are really careful.'

#### **Affordance in relation to touch and movement (haptic senses<sup>4</sup>)**

So far, I have discussed how affordances are relational to physical characteristics, skills and intentions, which influence what we perceive. When these are taken into account, the concept of affordance can help understand the use

<sup>4</sup>. Haptic perception is discussed at length in chapter seven, but it is helpful to provide a brief definition here. Susan Lederman and Roberta Klatsky (2009) explain that haptic perception is 'a perceptual system comprising both cutaneous and kinaesthetic subsystems. Haptics refers to perception that results from movement and touch.'



of digital technologies for the process of book design. In addition, there is another area that deserves to be singled out. The affordances of objects are not only perceived visually; touch and bodily movement also have important roles to play. For instance, the suitability of paper as a possible writing surface may only be perceived through touch to determine its surface quality, just as the handling of a book may invite different actions that were not perceived through sight alone. Weight is one example. I now turn to our sense of touch and movement (haptic senses) and how these are implicated in our perception of the actions an object invites. This is clearly of relevance for the design of a printed book, as a designer can think of meshing both visual and tactile qualities to create a book that can invite a number of actions. The design of a book can invite or discourage reading, repeat use, preservation, annotation, portability, display and attachment. Our haptic senses are also relevant for a designer using digital tools; in comparison with traditional tools, these tend to reduce both our range of bodily movement and our handling of physical materials, thereby altering the range of possibilities we may perceive. Pre-digital processes naturally involve more actively physical labour. This is coupled with the fact that physical materials have the potential to be directly held, touched and manually manipulated, which, as Hewson (1994) concludes in her research on paper sketching, provides possibilities that electronic forms lack.

Gibson does not entirely ignore touch, but does not explore it in itself. For him, 'seeing and touching are two ways of getting much the same information about the world.' (Gibson, 1979: 254). This is arguably not the case, as our sensory organs supply different kinds of data, but he does stress that his understanding of vision takes into account bodily movements. In fact, he goes as far as to coin the term 'visual kinaesthesia' (1979: 126) to acknowledge that whole or partial bodily movements change the quality and quantity of information we gather through sight. (Gibson, 1979: 125.) In other words, he acknowledges that human movement is essential to what we perceive—an idea that has since formed the basis of more specific research.

For book designers, active inquiry through touch and movement is not afforded by digital technology, or at least only in a restricted or indirect way. It



is possible to step back from a screen, but this is not comparable to the kind of ‘walking around’ a physical design that my interviewee Simon Loxley describes. Building on the concept of affordance and behaviour, Bruno Mantel (associate professor in human movement science) and experimental psychologist Thomas Stoffregen have studied the relationship between movement and the possibilities we perceive. Together they examine evidence that actual bodily movements (in addition to physical attributes and skill) provide another dimension to the perception of affordances. Linking the active nature of exploratory movement with the intention to gather sensory data, they focus on ‘what people do to obtain information about affordances’ (Stoffregen and Mantel, 2015: 257). Combining their appraisal of existing literature with the results from their own experiments, the researchers conclude that the perception of affordances is highly dependent upon the movement of a perceiver. In other words, our ability to make exploratory actions through physical activity, rather than simply through what we can see, affects what possibilities we notice. Their work draws on laboratory research carried out by Mark et al (1990), who conducted experiments to examine the accuracy of perception in relation to an observer’s ability to move. The experiment studied how participants judged the possibility afforded by a chair when blocks were strapped to their feet. The results showed that inaccurate judgements were made about the suitability of the chair for sitting on when a response was purely based on visual information gathered from a stationery position. The participants had to be able to move when viewing the chair in order to perceive its suitability as an object to be sat upon. This supports the view expressed by my participant Simon Loxley, that changing distance and position in assessing the qualities of a design is important for what we perceive. If general physical movement is limited, our ability to acquire information in a given situation is correspondingly reduced, to the point where our perception may become no better than guesswork (Stoffregen and Mantel, 2015).

How we engage our bodies, and specifically our hands, to explore and make judgements through touch and movement is important for the process of book design. Research into the use of letterpress process (see chapter three) has already indicated that giving students the opportunity to use physical type gives them a different understanding of typographic space. This is likely to

come through manual manipulation of physical type, but also through general bodily movement around the workspace. One design student explained to me that she only became aware of negative space through having to position physical strips of metal for a particular project (name withheld, 2018). David Jury picks up on a similar point. From his extensive experience of design teaching, he notices how students struggle to grasp certain ideas such as leading (interlinear space). His reasoning is that '[...] leading used to be obvious, but with digital technology it's an obscure thing that students have great difficulty to figure out, just because it doesn't explain itself on the screen very well.' Here he connects the way a piece of physical material suggests its use; by comparison, software describes space numerically via an information palette, which lacks the material properties that more concretely indicate space between lines of type, or around an image. Without touch and handling, we limit the ways we perceive space.

The relationship between our haptic senses and affordance also supports the idea that evaluating a layout from a hard copy increases our perception and leads to better judgements in comparison with the relatively static nature of viewing a page on screen. Simon Loxley notices that the possibilities of standing back or walking around to contemplate and appraise work from a range of distances and spatial perspectives is a vital part of the process and an aspect that he believes 'gets lost with digital'. He compares design with fine art, and reflects, 'a lot of the most valuable time spent is not actually painting but by staring at it and deciding what's right or wrong and where you go.' In the same context, he also states that when he draws a design on paper, he can hold it in his hand and that 'then you get a physical sense already.' As Rachel Hewson concludes in her work on traditional sketching, paper affords tactility which can alter visual perspectives. Through its surface properties, computer hardware has a capacity to fix us in one position, or at least it does not invite us to move away and around—an activity that allows us to pick up more information simply from viewing something from different angles. Of course, the technology provides the opportunity to output physical copies of our designs with ease, yet remarkably, the designers I interviewed appear to rely on this less and less. Dale Tomlinson rarely prints hard copies as part of his process. He comments: 'I'm bad at that. I don't know if I think I know or

if I do know what I'm dealing with, and I just get it right on screen. [...] I did it last year once. It's good and bad. It makes me think I'm capable of doing it without referring to a print-out.' Yet, on the occasions that he examines hard copies, he reveals a different way of working: 'When I do print out, I have to trim it down and slide it into a book of the same size, pretend that I am flipping through it. I might suddenly compare it to something else, and say, have a misjudged this one? It might optically look smaller. Yes, maybe that needs to go up half a point.'

This fits in with Hewson's observations. Dale is unlikely to produce a physical version of his design, yet from his account, when he does so, he responds to the affordances of paper which invites itself to be folded, manipulated and compared in tactile and visual ways with existing, printed books. This clearly alters what he perceives. Dale's comments indicate well how this can enhance design decisions.

By contrast, Michael Mitchell and Susan Wightman at Libanus Press insist on printing out their designs, acknowledging that it enhances their perception. Michael describes the screen as 'a wonderful, fluorescent, deceitful bitch really! And you can look at it and think isn't my work glowing and wonderful and you print it out and you think ... did I really think I could do it that size?' Susan describes her reasons for having a physical copy. '[W]hat you are seeing on the computer looks so close to a finished thing, that I think it would be easy to produce a page of type and carry on going. The thing that stops you from doing that is printing it out.' By looking at the printed version from different distances and angles, and at actual size, the likelihood is that we make different judgements about both type and spatial arrangements.

This leads to one final point. Digital technology not only fails to invite us to explore with our hands or through active movement, it also fails to invite us to 'doodle' in a way that pen and paper might. This is an activity that designer Berenice Howard-Smith finds useful, although she cannot pinpoint why. She says: 'As much as I love Macs, there is something quite nice about sitting even in a meeting with a pen, and you might just doodle something, and it [has] a nice fluidity to it. Something really good about that.' The kind

of semi-conscious doodling that Berenice refers to cannot be replicated with digital devices because to move a mouse or a pen on screen requires us to look, not simply to feel. Moving a pen or pencil on paper gives us direct haptic feedback, which as yet, no digital tool is able to match.

### **5.3. Concluding points**

Gibson's theory of affordance continues to have relevance for contemporary issues, and variations of it are providing useful frameworks for different research areas. For instance, scholars from science and engineering have adapted the concept, making it applicable for practical and theoretical purposes. I have also found affordance theory to be applicable, and have drawn on different aspects of old and new theories to highlight the ways in which the properties of digital technology invite certain actions in comparison with the technologies they have superseded.

I have discussed how physical characteristics, skills, intentions and haptic senses (i.e., movement and touch) affect the affordances we perceive, and have related this to book design process. I have also indicated that designers should think about affordance in relation to any book they are involved in creating. For example, designing thumbnail cut-outs at the fore-edge of a dictionary can aid navigation, but also invite a user to flick through. In summary, the affordances of an object, or technology, are presented and perceived according to an interrelated set of conditions, which in turn are derived from our personal attributes—corporeal and cognitive. Our actions and perceptions, therefore, are in a reciprocal relationship. As Heft (2010: 15) elegantly explains, 'perceiving guides actions, and actions facilitate perceiving.' This has something in common with Gibson's notion that possibilities for action are both subjective and objective.

My interview data indicates several ways in which different technologies invite different actions. First, design software offers possibilities for making patterns with type and other forms with ease. Through the affordances of movability and malleability of digital objects, and the lack of physical presence, the technology offers a great degree of experimentation and latitude for

designers. Yet, the physical properties of computer hardware impose other constraints attributed to reduced mobility and a fixed screen size. In addition, the constraints offered by older technologies may have some creative advantages. While it is true that the digital environment reduces physical effort and time through the possibility to reverse easily any action, this appears to have the side-effect of reducing the need to think things through carefully in advance, to anticipate problems and to exercise mental visualisation.

Although disagreements continue between scholars of affordance theory over the idea of direct perception, many generally accept that surface (or material) properties are important to the possibilities we perceive from any object. This links with the post phenomenological position developed by Verbeek and other philosophers, who emphasise material properties when they discuss technological mediation. Bringing the two threads together, it is possible to support the view that digital technologies afford or present a different set of opportunities for designers. And yet, whatever possibility is perceived occurs in a way that is mediated, as the previous chapter discussed. In other words, how we respond to what a technology offers is not just determined by individual attributes, physical movement and aims, but also by the technology itself.



## Chapter 6: The mind – computational and embodied

*I am going to begin to write what I do not know myself, trying as much as possible, to let my spirit and my pen be guided by their movement, not making any other than that of the hand.*

(Guyon, 1682, cited in Radman, 2013: 201).

So far, I have drawn on theories from philosophy and psychology to make the case that our interactions with technologies and objects shape how we think, what we perceive and what we do. This happens on the one hand through the ways technology mediates our actions, and on the other, through our perception of the possibilities that different objects present. In both cases, the material qualities of the objects, devices and technologies that we encounter are a factor. In this chapter I extend the discussion by introducing theories of cognition—i.e., theories concerned with our mental activity—to add another way of examining the effects of digital technologies on the process of book design.

I begin with an outline of selected literature on twentieth and twenty-first century theories of cognition, with the purpose of providing a background to an extensive field and of explaining in sufficient detail recent prominent developments. While I begin with a summary of standard cognitive theory, the emphasis of this chapter is on the recent turn towards embodied cognition—a term which is often used as an umbrella for a variety of cognitive theories with one viewpoint in common: the notion that the body (and in some cases, the external environment) is involved, in different ways, in our mental processes. This turn within the cognitive sciences emanates from research carried out within different disciplines, yet each has something to contribute to the expanding body of theories about how we think and perceive. Collectively these ideas challenge the dominant computational theories of the mind—ones which hold that our bodies are peripheral to our capacity to think.

While recognising the complexity and lack of certainty that exists around our understanding of the human mind, for the purposes of this thesis I settle on an

approach to cognition that contends that thinking and doing are part of a cognitive system which involves our whole bodies, as well as the material objects with which we interact. From this position, I examine my interview data, drawing on the arguments I outline to look for clues as to how the cognitive process of book designers is affected by the nature of their interaction with digital tools and the digital environment.

### **6.1. The Meaning of embodiment**

To understand embodied cognition, it helps first to be clear about the meaning of embody or embodiment. ‘To embody’ means to give physicality to—i.e., make tangible, visible, or concrete in some form—something that might be described as disembodied. This might include an idea or an abstract thought, although embodiment theories are based on the premise that minds and knowledge are the result of a network of meanings formed through bodily actions and reactions. In other words, meaning cannot be reduced to matter, but equally, it is indissociable from it. So, although it is hard to argue that thought is disembodied, or immaterial, it is valid to say that through the medium of print and especially through the printed book, knowledge and ideas are embodied, or more specifically translated into a distinct, physical form. Walter Ong outlines a similar idea in his declaration that movable type and letterpress printing ‘embedded the word itself deeply in the manufacturing process and made it into a kind of commodity’ (Ong, 1979: 116). Designers’ thoughts and ideas could also be said to be embodied—and embedded—in a printed book. Design decisions are conspicuous in the physical artefact, even if good book typography, by some definitions, is invisible. In addition, book designers contribute to ‘the physical articulation of a text’ (McKenzie, 2002: 217). In this way, the printed book is a perfect example of a process of embodiment of the ideas of both author and designer.

The word embody and its derivatives have become familiar in recent years and their usage has become commonplace in many fields. Within art and design, Anthony Raynsford (2009) states embodiment is a theme that has re-emerged as ‘one of the dominant motifs within contemporary art’. It is also a prevalent theme in the fields of literature and bibliography. The Cambridge



Centre for Material Texts, established in 2009, is one example of initiatives aimed at ‘transforming our understanding of the ways in which texts of many kinds have been embodied and circulated’ (Centre for Material Texts, n.d.). Not surprisingly, there is a corresponding rise in the occurrence of opposite terms, such as disembodied, incorporeal, discarnate. The reasons for the interest in embodiment and disembodiment are hard to pinpoint, but it would be shortsighted to argue that an appreciation of the physical and the tangible is unrelated to digital culture. Digital objects and the virtual worlds of the twenty-first century have brought with them a parallel sense of intangibility and, in a colloquial sense, immateriality. This has arguably created a renewed interest in the concrete, tangible world and our relationships to physical things, as we question the effects of technological change. Such a trend towards the physical is in line with the direction seen in the cognitive sciences and a recognition that how we think is inseparable from our physical selves and our physical environments.

## **6.2. Cognitive science and theories of mind**

I have said that the concept of embodiment is prevalent within the arts and humanities, but the term is more specifically associated with the field of cognitive science and the significant shift towards ‘embodied’ approaches to studies of human consciousness. This shift has led to different ways of understanding how we think, by incorporating the idea that our physicality is in fact part of our cognitive system; in some cases, that system is extended to include the external world. These theories have relevance for studying the process of design, where both manual and mental activity are combined in the making of a printed book—a technological and cultural object that in itself transforms the ways we think (McGilchrist, 2012). Yet pre-digital and digital technologies require different manual activities, altering the relationships between the hand and the mind. It is therefore natural to turn to theories of embodied cognition to help understand the connections between the two.

Cognitive science as a delineated field of study is relatively young. While its origins can be traced back to the 1950s, it properly surfaced in the 1970s and is best described as a collective term for the range of disciplines that are con-

cerned with understanding the mind, the brain, or perception. The diversity in perspectives makes the field both rich and complex. Working within the field themselves, Francisco Varela, Evan Thompson and Eleanor Rosch (1995: 4) describe cognitive science as a ‘loose affiliation of disciplines’. Philosopher Michael Rescorla (2015: n.p.) offers a more specific description, breaking down the terrain into studies of the mind that ‘[draw] upon psychology, computer science (especially AI), linguistics, philosophy, economics ... anthropology, and neuroscience’. While the subjects of study (i.e., mind and brain) are common to all the disciplines, the emphasis that each provides is circumscribed. For instance, whereas neurobiologists aim to understand the physical workings of the brain such as how neurons connect, or which parts of a brain are responsible for certain cognitive activities, philosophers of mind and psychologists are concerned with the more nebulous notions of consciousness and perception.

### **Standard theories of mind and the mind–body problem**

To highlight the progressive nature of embodied cognition theories, I start by a comparison with the longer-standing, dominant alternatives. Alongside advances in computer technology in the twentieth century, the human mind came to be understood as an information-processing system. The Classical Computational Theory of Mind (CCTM) became the predominant and largely uncontested model for core cognitive processes in the 1960s and 70s. Under this paradigm, mind is seen as computational, and described as ‘consisting of operations over symbolic representations’ (Shapiro, 2011: 14). These and other models of cognitivism hypothesise that cognition is limited to ‘mental representation’ (Varela, Thompson and Rosch, 1995: 8), where sensory inputs are converted into symbols which can then be processed. Such theories lead to the assumption that cognition takes place only in the brain (Tanaka, 2011). It follows, then, that from this perspective, cognitive scientists have no reason to focus on anything other than the brain to understand the human mind, and for many years this has been the prevailing approach.

Standard computational theories have been enhanced and adapted over the years in response to advances in neurophysiology and the discovery of neural networks. Yet they still retain the fundamental view that the brain is an

organ for processing inputs and outputs in a way that is comparable with a computing system. However, challenges to such theories have come from advocates of an embodied approach to understanding the workings of the mind, or from those who dispute the Cartesian idea of duality of mind and body. This duality between mind and matter, or mind and body, is an important divide and, as Michael Zimmerman argues, is ‘the most vexing problem in science and philosophy’ (2012). The mind–body problem could also be expressed as the mind–brain problem, where mind is defined as ‘cognitive function’ and brain as ‘neural structure’ (Figdor, 2013). Being so far from an agreement over what mind is, or ‘what sort of stuff it is made of’ (Malafouris, 2013: 2) it is easy to see why we are a long way from comprehending where it resides and what constitutes thinking. However, it is not necessary to resolve this fully in order to investigate change in design thinking and process; taking a non-dualistic, embodied view of cognition is sufficient for providing some insight, as I argue below.

### **The cognitive turn**

Put simply, the cognitive turn—as it is known—starts from questions of whether mental activity can, or should, be studied separately from our physical bodies, and then seeks to explain why the study of cognition should not be limited to the neural functions of the brain. Van Gelder (1995: 373) explains the limitations of standard (computational) cognition theories by making the point that if we believe that ‘the cognitive system traffics only in symbolic representations, the human body and the physical environment can be dropped from consideration’. Yet, developments in artificial intelligence are revealing the limitations of such a model (Wolpert, 2011). Cognitive scientists interested in embodied mind argue that it does not make sense to exclude the human body, or even external objects, from our mental processes. This seems to be borne out in everyday activities, from fixing a broken chair to making a mathematical calculation. It is clearly the case with design, where ideas are initiated, captured or developed with the help of either pencil and paper, or software and screen.

While there is still a clear divide between the cognitivists and the embodied mind theorists, there is evidence that the latter view is gaining weight, even

within the neuroscientific community. In a paper entitled ‘Bodily Awareness’, de Vignemont (2016) states categorically that the ‘study of the body is now crucial in cognitive neuroscience’. The forms of embodied cognition, some with roots in phenomenology, are providing serious alternatives to the standard theory of mind. The effects go further; as their influence is felt in other disciplines, embodied cognition is challenging what we take for granted in terms of human knowledge, experience and behaviour in all fields. In the narrower context of this research, such theoretical perspectives are clearly useful for making sense of a designer’s interaction with digital technologies and how digital media may affect not just design process, but also how we respond to different forms of the book.

### **New theories of mind: embodied, enactive, embedded, extended**

Varela, Thompson and Rosch are credited for setting out one of the earliest cases for embodied, or more precisely, ‘enactive’ cognition. Their research was an attempt to blend the biological with the phenomenological, through their emphasis on lived experience coupled with their view of the body as a context for cognition (Varela, Thompson and Rosch, 1995: xvi). Their theory is best explained in their own words, where the term embodiment serves to highlight the idea ‘that cognition depends upon the kinds of experience that come from having a body with various sensorimotor capacities, and [...] that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological and cultural context’ (1995: 172).

Their work remains important, but the field has expanded considerably in breadth and depth, and other theories based on embodiment have since emerged. Each of these theories offers an explanation of how our bodies are implicated in our mental processing, either causally or constitutively. In addition, there are approaches that go further. Key philosophers such as Clark and Chalmers (1998) and Gallagher and Zahavi (2008), argue that mental activity extends beyond our physical bodies and into the external world, and that cognition is partly constructed in partnership with our environment (Clark, 2008; Gallagher, 2006). This is, perhaps, where the boundaries between cognitive theory, philosophies of technology and theory of affordance begin to converge. Theories that include external objects as part of our mental process are

described as extended, and both embodied and extended approaches offer ways of investigating how designers think—either through and with their bodies (embodied), or through and with their design tools (extended). It is by combining these outlooks that I examine my data further on, based on the premise best described by Hutchins: ‘[...] thinking is interactions of brain and body with the world. Those interactions are not evidence of, or reflections of, underlying thought processes. They are instead the thinking processes themselves’ (Hutchins, 2008, cited in Malafouris, 2013: 38).

I have introduced the terms embodied and extended and noted where they differ, but there are other variations of cognitive theory, each of which tends to fit, if imperfectly, into one of the following categories: embodied, embedded, ecological, enactive, extended, distributed or situated. These categories and the theories they encompass need to be outlined before I turn to my interview material to look for evidence of embodied or extended thinking among my design participants, and any change associated with digital technology. However, it should first be noted that categorisation is anything but straightforward, as key scholars in the field appear to classify the theories in different ways. Taking these differences into account, I choose to follow philosopher Shaun Gallagher’s way of distinguishing between cognitive theories, positioning enactive, extended and distributed cognition as subsets of situated mind. This not only fits with my own perspective, it also makes good sense to use ‘embodied’ and ‘situated’ cognition as umbrella terms. Regardless of how they are classed, what the theories I cover share can be summarised as follows: none limits the concept of cognition to what happens in our heads. All point to the role of the body and, in some cases, the role of external objects in shaping our mental processes. Where they diverge lies more in their explanations of both how and to what extent such shaping occurs.

## **Embodied and situated mind: an outline**

### *1. Embodied cognition*

It is useful to bear in mind that all non-computational theories of cognition are embodied and therefore the term can encompass all the following theories in a general sense. However, embodied cognition also refers specifically to the idea that the body is directly implicated in our thought processes. Drawing on

Wilson and Foglia's understanding, embodied cognition can be identified as 'deeply dependent upon features of the physical body of an agent, that is, when aspects of the agent's body beyond the brain play a significant causal or physically constitutive role in cognitive processing' (2011: 2). Again, it is possible to draw connections with recent directions in affordance theory as discussed in chapter five, which argue that both physical characteristics and actual bodily movements affect how we perceive and interpret possibilities offered by our environment.

## *2. Situated cognition*

The theories that fall under the umbrella of situated cognition all take what we recognise as intelligent activity beyond the body and sensory perception, arguing that the world outside participates in how we think. In other words, the underlying principle is that the environment actively shapes thinking (e.g. Wilson and Foglia, 2011), or that knowing and doing are co-determined and therefore cannot be separated (Clark, 2008). Knowledge therefore is indivisible from the physical, cultural and social contexts in which humans exist and is formed through a dynamic relationship with the body and the world. This adds support to the concept of tacit knowledge—a form of knowledge that can only be acquired through doing—that is, bodily engagement—as opposed to instruction. This has been noted through design research projects (discussed in chapter three), that have concluded that physically handling type improves knowledge of space.

According to Gallagher (2008), situated cognition also encompasses enactive, extended and distributed theories of mind, but each has a different emphasis. These variations provide sufficient shifts in viewpoint to extend the ways of looking at design thinking in relation to digital technology. I therefore outline these differences briefly before drawing out the points I take forward to examine my interview data.

### *a. Enactive mind*

As mentioned above, enaction is associated with the work of Varela, Thompson and Rosch. This phenomenological approach is centred on the argument that cognition is constituted by our body's actions and how we physically

interact with an environment, alongside the neural activity in our brain. Although an agent is seen as autonomous, cognition is dynamically linked to the environment through our sensorimotor system (Thompson, 2017.) Relating this directly to design, we can say that design process will be in a dynamic relationship with the objects with which we interact, and therefore affected by the structural characteristics of the implements we use, as well as our individual physical attributes and the meanings we construct.

Gallagher is one advocate of enactive mind theory, which he prefers to describe as the integration of perception, thought and motor activity (Gallagher, 2008). He argues that there is not a one-way system from hand to brain or brain to hand and uses the relevant example of drawing to show this reciprocity: ‘Practising one’s drawing, of course, will result in plastic changes in the brain. It seems these plasticity effects accompany whatever habits one forms with one’s hands’ (Gallagher, 2013: 213). Again, the implications for design processes are clear. If motor activity has a transformational effect on the neurological workings of our brain, then the changes in tools and levels of manual engagement with physical materials used in the process of design may have physiological consequences for what and how we think. (While the consequences may be hard to test, it is an area that warrants further study, especially with respect to the act of handwriting or hand-drawing and the implications for cognition.) The theory of enaction, then, points to the intricate connections between knowing (cognisance) and doing. For Gallagher, it also suggests the occurrence of neurological change in the human brain, as we adapt dynamically to interactions with different objects.

#### *b. Extended and distributed cognition*

Where embodied cognition is limited to the role of the body, extended cognition argues that the external environment is instrumental in our mental processes. Distributed cognition diverges from the enactive view in that it specifies how humans actively use things in the world to extend their mental capabilities. One aspect focuses on the notion that what is usually considered to be cognitive work is discharged, or ‘off-loaded’, to an environment through different means. A typical example is how we might use a notepad to list things, thereby reducing the mental effort required to memorise them. A book,



as a store of information and ideas serves a similar purpose, enabling us to recall only its location and appearance in order to retrieve what we need. Of course, the internet provides a similar function, enabling us to find information by recalling only a URL (Uniform Resource Locator, or web address). One distinction between print books and digital forms of the same text is that the physical qualities of the book are key to how we retrieve whatever we have tasked it to hold. The object offers different ways for us to off-load.

Distributed or extended cognition is not limited to the idea of ‘the world as an outside memory’ (O’Regan, 1992: 461). Rather, it theorises that we use objects to actively participate in our thinking process. Such activity is exemplified by a conversation between the Nobel Prize-winning physicist Richard Feynman and history of science scholar, Charles Weiner. When Weiner described Feynman’s papers as a record of the work done in his head, Feynman insisted that his work was in fact carried out on paper, challenging the assumption that paper was simply a means to record, communicate or display his ideas. He explained: ‘It’s not a record, not really. It’s working. You have to work on paper and this is the paper’ (Gleick, 1992).

Similarly, particular associations are being made between thought processes and the act of drawing on paper. Brew, Fava and Kantrowitz (2012a: 79) describe drawing as ‘a highly useful means to externalize and extend mental processes as they occur.’ There are also suggestions that the hand contributes to the work itself. Recounted experiences indicate that what we think of as a mental event can also be seen to take place in collusion with external objects. For instance, observing an architect in the act of hand-drawing, I asked if he always started his design work in this way. He responded ‘I like to hand draw [...] it’s quicker and often my hand has better ideas than I do’ (Ross, 2018). Ross’ comment fits with what Ritter and Haschke (2015: n.p.) describe in their research on human dexterity as ‘the reach of our “mental hands” beyond our own thoughts.’

Given that both past and present book-design practices depend on interactions with a range of technological objects, the theory of extended cognition is particularly pertinent for investigating the relationship between tools and



design thinking. It therefore warrants more explanation. Andy Clark and David Chalmers are key figures in this area, contesting cognitive theories which conflate brain and mind, or see the body simply as a sensor for the brain (Clark, 2008: xxvii). Both adopt a line of reasoning that challenges our concept of mind by disconnecting cognitive process, if temporarily, from our heads. Clark and Chalmers call this ‘the parity principle’ which is best explained in their terms:

If, as we confront some task, a part of the world functions as a process which, were it done in the head, we would have no hesitation in recognizing as part of the cognitive process, then that part of the world is (so we claim) part of the cognitive process (Clark and Chalmers, 1998: 8).

Relating this to book design, we might imagine the act of folding and unfolding a sheet of paper to work out page imposition for printing. This is useful where colour is to be printed on one side of a sheet only, enabling a designer to know where to place colour images. While this could be worked out in our heads, using paper externalises the cognitive process, allowing us to work things out as well as to have a record of the result.

In the above survey of embodied cognition I have drawn on the ideas that I consider most useful. The main threads can be summarised by stating that mental processes, the body beyond the brain and external objects are increasingly considered to be mutually constituted. The dominant models of the brain as a sequential computing process are being effectively challenged by models that favour the notion that brain activity ‘is largely self-organizing, nonlinear, rhythmic, parallel, and distributed’ (Varela, Thompson and Rosch, 1995: xix).

I have argued that such theories are apposite for investigating the effects of digital technology on design processes, adding to and supporting the work covered in the previous chapters. I apply selected theories of embodied mind to design activity by scrutinising my data for examples of the following:

- i. how the use of our bodies and physical engagement with the world is essential for design conceptualisation;
- ii. how designers use the external environment to off-load part of their mental activity, or use objects to reduce their cognitive load or distribute thinking across a range of external things. Cognitive processes can also be distributed to bodily movements, such as the act of gesturing (Clark, 2013), or using fingers to make a shape to aid recollection of a pin number;
- iii. how physical interactions differ between digital and pre-digital technologies and if this leads to different opportunities for off-loading, or ways to extend a designer's cognitive process.

Following Gallagher's theory that cognition is a fusion between motor activity, thought and perception, I specifically look for indications of the relationships between thinking and doing. I also look for evidence of how designers use physical materials and manual skills in their process, and how this has changed with computer technology. In addition, I look for examples of how my participants interact with their physical and digital environment and how they harness the outside world to off-load tasks.

### **6.3. The embodied, situated mind and design process: a view from the field**

#### *Enactive mind and tacit knowledge: knowing through doing*

Drawing on the theory of enactive mind and, in particular, Gallagher's interpretation as a fusion between motor activity, thought and perception (Gallagher, 2008), I find clear connections with comments made by some of my designers. This manifests as an acquired intuition for knowing in the form of sensing what is right, or even carrying out an action without conscious thought. Craftspeople and others who work with their hands commonly allude to how actions become automatic through practice in a way that seems to bypass the brain (Dormer, 1997; Crawford, 2009). This idea comes across strongly through the reflective comments of book designer Dale Tomlinson. He talks about having 'just typographic know-how'—akin to the kind of tac-

it knowledge first introduced by Polyani (1958). This form of knowledge is often described as ‘know-how’ rather than ‘knowing that’, or ‘procedural’ as opposed to ‘declarative’ (Norman, 1998: 57). Reflecting on his design process, Dale indicates that much of his knowledge has been acquired through practical experience and engagement with different materials and processes. We can understand this as a connection between thinking and doing, or enactive mind. Dale reveals the extent of his instinctual know-how in relation to design decisions, offering comments such as: ‘I think you just know when something feels right’ and that it is ‘...something we carry as designers with us. We just know – I find it fascinating, like any craft, the tools you use, the materials you use, you are so at one with them.’ While Dale is referring as much to digital tools as pre-digital ones, this raises an interesting point when it is contrasted with a comment made by designer Alistair Hall. Alistair points out that with design software such as Adobe Photoshop, there can be a loss of a sense of a clear endpoint. While Dale knows or senses when something is correct, Alistair suggests that the sense that something has reached an optimal point could be eroded in the digital environment.

Leaving that aside, Dale makes many comments that indicate cognition resides not solely in the brain. For instance, he states ‘I make these adjustments almost without thinking.’ Furthermore, he has become confident in his intuition. He says ‘The other thing I don’t do that often these days is print stuff out. The amount of stuff I do on screen, I just feel intuitively I’ve got it right.’ ‘I know exactly how it is going to work as a printed object, down to the tiniest detail. .... That’s just knowledge that we have of how we design it or how we know it is going to print.’

Designers also appear to have gained knowledge through active, physical engagement in order to solve problems. Designer and letterpress printer Phil Treble exemplifies this with his work in his studio. He describes some of the problems he has encountered, and how his understanding of the letterpress process has been acquired through physical interaction. He recounts:

That’s one of the great things about being in here and using the machinery. You know, on that press, you can adjust it, it’s not like

pressing a button. You are going through a whole make-ready process, looking at roller height, getting the ink even, and packing and pressure, because different papers are different thicknesses, and once you have got all that right, and whilst you are doing that, you are putting little bits of paper under the roller bearers and timpan, and fiddling with screws and so on, and that process is very enjoyable because you are solving a problem maybe, and each job is a different problem, and gradually over the years you sort of know the solution to the problem when it occurs.

Although Alistair Hall doesn't believe that design conceptualisation is hindered by solely using digital technologies, he makes an interesting point about the kind of knowledge that is acquired through physical, or manual practice. First, he indicates a kind of dissonance that occurs when working digitally to create a physical object. He states:

And obviously because we design on screen it is more difficult to ... you have to make a translation in your head to something physical to think how it's going to print, how is it going to over-print, how are the colours going to look on a different paper, how that paper is going to move and shake, and even having a library of different stuff as a reference library to kind of go this helps me understand what this is going to be like. That's where when you are learning design if you are doing silk screen printing and etching and linocut – all that stuff is helping you understand the physical nature of things.

He concludes that the understanding gained from the experience of manipulating physical materials helps when trying to anticipate how a digital object will transform into a physical one. This resonates with comments made by design writer and professor Jeremy Myerson in relation to craft: 'to get the best out of software one needs to know how to make things oneself' and 'One needs separate experience of making in order to use the computer software knowingly' (Myerson, 1997).

### **The shift from thinking in our head to thinking with the screen**

Comments made by my research participants indicate that knowledge required to design books with digital technologies is enhanced through the experience of hands-on work and that design thinking is not simply limited to the brain. In other words, there is evidence that know-how comes from the combination of physical and mental activity. However, my interviews expose a distinct change in the cognitive process that is directly connected with the dominance of computer technologies. It appears that digital tools have enabled and encouraged designers to rely more on the screen than their imagination for working out a design. David Pearson considers his short experience as a text designer at Penguin working designs on paper and writing out type specifications, before the department moved to the use of Macs. In discussing the differences between designing with and without the aid of digital tools, David Pearson refers directly to the connections between thinking and doing. He recounts:

I'd just been educated at college to use computers and to design on it. And then I went straight into a job where they didn't use them. We were almost just – we had to write a series of instructions on the manuscript. You were designing completely in your head which initially I found terrifying, but actually, looking back now, that's something that has really helped me. ... All that comes from doing the design in your head. There is this instant gratification you get when you design on a screen which stops you from thinking. And ultimately with what we do, you need to put yourself in a position where you are thinking and doing.

Strikingly, David suggests that pre-digital processes require comparatively more reliance on mental visualisation than when using digital tools to capture and work out ideas. In reflecting on his experience with traditional tools, he reveals his belief that the use of design software and a screen shifts the process away from thinking in our heads and more towards doing and reviewing. In other words, digital processes require less prior imagining or thinking, or reliance on what we might consider internal mind. This is an effect of digital

technology that David sees as a disadvantage, as he acknowledges the value of drawing on an ability to visualise, or hold pictures in mind.

As a professor of human-computer interaction, with a background in typographic design, philosophy and art history, Gillian Crampton Smith speaks with authority in these areas. With experience of founding interaction-design departments within art schools, she advocates learning through drawing type because of the perspective this provides (Myerson, 1997). In her view, ‘The computer always responds, offers options and alternatives, and it stops you thinking things through [...] We’re all lazy so we try different options instead of working it out’ (Myerson, 1997: 179). Given that embodied cognition argues that thinking and doing are parts of a whole cognitive system, Crampton Smith and David Pearson indicate that the relationship between the two may be altered by digital technology. There is reason to argue that in the case of design, digital technology is leading to a shift towards more thinking outside our heads. This is not in terms of working things out by using our hands in the same way Crampton Smith discusses, but more in terms of a reduction in prior visualisation, or mental imagining.

However, my design practitioners also show that a degree of mental visualisation is still carried out before the use of external objects and media, even with digital technology. This prior mental depiction is particularly evident with designers who have had more experience with pre-digital processes. For example, Simon Loxley reflects on his design process, and explains ‘I think a lot of designing I do in my head before I even do anything.’ He adds ‘The process – you are often as designers, in your head’. For him, first stages are always internally derived, as made clear in his statement ‘I think it has to start in your head with what you want to do and find out how to do it.’ In this way, the affordances of technology are more weighted towards intentions, and the cognitive process could be less well described as extended. Yet, it seems likely that what is imagined is still within the realms of the technological possibilities of which designers are most familiar, and therefore is arguably still co-determined with the experience gained from practical activity. As Alistair Hall relates above, the experience of non-digital processes has provided him with knowledge that he draws on; we might say that ‘knowing how’ has led to a

form of ‘knowing that’. This is also reported by artists working in areas such as photography. Skills learned using film processes render a depth of knowledge that experience with a purely digital-based process fails to provide (Fava, S. 2018). My designers certainly indicate that they have what we could describe as a digital tacit knowledge, but this is different from the tacit knowledge they have acquired through other processes. Carr (2015: 144) hints at this too. Drawing on research into sketching and thinking, he makes the point that drawing is ‘manual thinking’ and that design knowledge happens in the mode of doing. Most importantly, he concludes that ‘Designing with software on a computer screen is also a mode of doing, but it is a different mode.’

Further on in the interview, Simon Loxley adds to this point by comparing his digital practice with his earlier process. Prior to the Mac, he would work with paper and pencil for his conceptualisation and for drawing more precise layouts, paying careful attention to the typefaces that were available for the typesetting system at the time. He states:

I suppose you had to imagine a certain amount of things in your head really, you had to do a lot of planning – it was a very different process. But things like typefaces, I’d look at them really really closely and sometimes draw out [the] headlines. If there was a character in there you didn’t like, that might make you abandon the whole thing, but if you’d ordered it and paid for it, you were stuck with it, so there was more of that pre-planning. ... Thought processes were different.’

Simon is clear on the differences between digital and pre-digital design process, especially in terms of the degree of attention paid to the characteristics of non-digital typefaces before making a choice. Notably, Simon’s comment also shows how he would harness external objects to help his planning and evaluation. Through his activity of hand-rendering type he could consider the detail of the letterforms.

Dale Tomlinson’s experience of working with traditional media has made it possible for him to rely on his knowledge of how things work and use this to

visualise ideas mentally. He reflects: ‘... I can see so vividly in my head what it is going to look like. I go through it in my head and think “no, no, no, ooh, maybe that idea might work” and then start to make it as a real thing.’

He adds:

But as far as the use of type and layout, page design that sort of stuff, I have, I suppose because of my experience, a clear page in my head – how that page will look. I know the typeface I want to use, it’s almost as though I just need to get the program to put together what’s in my head, then look at it and go ‘that needs to be tweaked’.

While he is able to envisage a concept with a high level of detail, he acknowledges that it is the rendition on screen that enables him to make refinements, using visual perception alone to complete this process. Dale’s comments are useful in indicating how an idea mentally pictured is then worked out better when externalised. Dale describes quite clearly how he designs using software in the following way:

... you’re messing around digitally on screen, but you started out with an idea that this has got to be [pause] a caps design, maybe centred, maybe evoke a period of time, therefore in this typeface. Those thoughts come in very quickly, [...] so you might just open a blank document, size the book – I’m thinking cover now – start with that and go okay, look on the font list, yeah, this is roughly ... something like Caslon would do. You draft it in that, then open up a palette of colours and add a background, it just builds up like that.

My youngest participant implies that with digital technology, she turns to what is available as a digital font, rather than imagining typographic details of a design first. She explains:

Well I guess when you do it on a computer you are restricted to what fonts you have loaded up. You can only think what you’ve



got in the library, or have a search through to see what you've got. When it's in your head you can think actually I want it to look like this.

In spite of the tendency to work directly on screen, perhaps minimising prior mental depiction, most of my participants assured me that they could rely fully on their ability to imagine to create a design, if they were somewhat physically separated from the process by losing the use of their hands. Drawing on his pre-digital experience, Geoff demonstrated this ability to me by relating typographic specifications orally.

Yes, I probably could, because in the days when you hand drew your layouts, you accompanied it with very detailed specification, so for instance a chapter heading would be described like 36pt line feed (to the baseline, remember) to 10pt caps, 2 units letter spacing and centred. And then, 47pt line feed to chapter title which is in Bodoni 18pt letter-spaced 2 units, centred on the page. Turnover lines ... I'm designing the book in my mind now and describing it to you verbally. If the computer could understand that!

Yet he is quick to acknowledge that this might not be the case for students without a traditional, hands-on training. He speculates 'it is probably because of years of experience and years of writing out those specifications, and I wonder if your student could do that and it would be interesting to know.'

Other participants express similar views. David Jury believes he would find the process easy, but like Geoff, attributes this to his non-digital experiences:

That's to do with my background – because I've used letterpress, and because I've been involved with phototypesetting where everything had to be explained. Okay, it was explained visually, but with type, I could explain exactly what I required from a typesetter over the phone. And if you are designing a book and you know what the margins are, it is describable.'

Working from a mental picture is clearly possible for someone with this level of experience, but David points out certain limitations:

It would end up being a slightly boring book! Because you'd end up with, just like you did with phototypesetting, you'd keep things fairly simple, you would describe what is describable. [...] that would be a creative limitation.

Simon Loxley indicates that not being able to use his hands would represent a loss, even though he often begins with an idea in his head:

Yeah it could be done. I'd have no means of making any mark, I'd just have my eyes and voice so you'd have to summon it up in your head. I think it would take away a little part of the process. I think I could do it, but yeah, it would take away how I start.

From his position as an educator, he also believes that this is not something his students could manage, as their experience is limited to digital processes:

I think a student today would find that very difficult. The terminology of how to describe type – the size, the leading – all of those sorts of things – the line length is really at the front of your brain all the time. A student – the terminology isn't there because it is all on the screen and they have learned to press certain buttons, so why do they need it?

David is not simply saying that students lack the vocabulary of typographic design, he is suggesting that the physical handling of type makes sense of terms such as leading, body, face. Again, thoughts, sensory perceptions and manual actions are parts of an entire cognitive process.

### **Off-loading and extended mind: the external environment and design thinking**

For my design participants, it is evident that they have an increasing tendency to use only their computer, or 'the screen', as they refer to it, for whatever job

is in hand. Although they often start with some prior mentally envisaged idea, their initial concepts and plans are mostly worked out digitally. Geoff Green is one of two exceptions. He explains:

I still design every book on paper. I still draw out, I get a piece of A4 paper out of the bin, and I draw on the back the trim size and the margins. I always do it on paper first – I find it helps me to visualise those spaces far easier than on screen.

Geoff's method is an example of thinking through and with bodily action and external objects and corresponds well with Feynman's insistence that paper and pencil are not separate from the work, but integral to it. For others, their physical interactions are with computer hardware rather than paper and pencil. Being considerably younger than Geoff, Alistair Hall is ambivalent about the benefits of working on paper and believes that the digital environment is more helpful to him as a means of working through ideas:

I'd be limiting my ideas if I just worked on paper, I'd be rejecting stuff because my draughtsmanship is so rubbish, whereas actually by having the tool that is more sophisticated I can try stuff out and think wow, that's doing something interesting.

Referring again to his lack of drawing skill, Alistair reflects on the differences between working on paper and on screen, and says: 'I work much better looking at a thing working on a computer.' However, he adds: 'I think my good ideas come when I'm not near either of those things. When I'm sitting on a train looking out of a window, I think a lot more lucidly than in other situations.' Alistair's comments point in two ways. First, he indicates that he responds differently to ideas he captures on screen, because they are more complex or finessed. Perhaps this reduces the cognitive effort required to interpret rougher, pencil drawings. Second, he mentions that his ideas often occur without the use of any form of technology, or when his mind is allowed to drift. From his example it is possible to deduce that he is drawing on his environment—for instance, the landscape—as part of his cognitive process. It is hard to imagine the same ideas occurring in an environment with no sensory stimuli.

Like Geoff, David Jury also uses pen and paper, believing that it is ‘important that I sketch things out first’, even though he plans ‘to a large extent on [his] computer’. He believes the work on screen has a specific function—it ‘is just a way of getting that bigger picture worked out in your mind.’ Either way, his design thinking occurs in conjunction with his tools, mixing the advantages of each medium.

Considering how designers use their work spaces to support their thinking, it seems that there are some differences in their behaviour with their physical desks and their computer desktops. In relation to how we engage with our environment as part of our cognitive process, Crawford (2015: 33) describes the working environment as a ‘space for action’—an area that he sees as serving as an extension of ourselves. He draws on various work practices to demonstrate how the environment and equipment is arranged to aid thinking. For instance, he describes how a chef arranges his preparation area and tools to enable flow and a more automatic process. This could be mirrored by designers working with pre-digital technologies, where pens, scalpels, rulers and other tools may have been arranged on a work surface to reduce physical and mental effort. However, compared with a physical desk and manual tools, the digital environment is significantly different. On the surface, the screen is a confined space, yet offers the possibility to access an extraordinary number of digital objects that are hidden from view. To retrieve a file requires remembering where it is located, triggered by how it is named or differentiated in some way. Tools are accessible through tiny movements of a mouse (or another pointing device) and a click, and cannot wear out. Furthermore, unlike the physical space, there is the potential to store a nearly inexhaustible amount of objects in digital form.

With this in mind, I asked my interviewees how they organise both their physical and digital desktops. This was to discover how they purposefully shape these environments or customise their tools to off-load or distribute cognitive effort, and whether their organisation differed between the two. It appears that most of my designers do not customise their digital tools. This might be because the way they feel and work is not variable, or personal in the way that a pen, pencil or scalpel can be. When it comes to organising their workspace,

while some of my designers show similar habits, others show different behaviour between the physical and digital environment. Alistair Hall describes his methods by contrasting them with my other participant, David Pearson, with whom he shares a studio. He admits that he would like to refine his digital tools more. He states:

Every time I do things I think this would be much easier if I'd done this. That's slightly laziness and slightly ineptitude. I'm quite tidy with my desktop and the way I organise my filing. The way I organise my computer space is more influenced by my desire for clarity and simplicity than by anything else.

He then describes David's computer desktop.

His technique is to open everything and have it all open on his desktop. So when he closes down he doesn't quit anything he just shuts the thing down and then it opens up it takes hours, 300 emails open and 200 documents. ... And actually that mirrors the way his desk is. He builds piles of stuff around himself and he nests down until he has a little cocoon of work space.

Dave Pearson gives his own account of his physical and computer desktops: They are both very full and ... I just have piles of things. In my head they are organised, tidy. But to someone else they are not. But that really is just the desk. The rest of the way I live is minimal and empty. But, when it comes to my mind, working, I've just got piles around me.

Although it may appear that David fails to organise his workspace to facilitate his work, his method can be interpreted as distributing the cognitive load. There is no indication that he doesn't know exactly where everything is. With a computer workspace, to file everything in multiple layers may require more mental effort in recalling where things are because so much is out of view. In fact, David does have methods for off-loading mental activity, using colour coding as a way of indicating the stage of a project. He describes his digital folders as pretty well organised but describes the actual computer desktop as

having ‘lots of little inspiration things grabbed off the internet.’ For David, the screen acts as an extension to memory, in effect an immediately perceptible dumping ground for visual ideas.

Berenice Howard-Smith does arrange her work tools to aid memory and work flow. She explains: ‘[the tools are] always in the same place and I customise my palettes. [...] I like to try and customise InDesign, anything that I can to make it work more efficiently for me.’ Yet she has different approaches to both her computer desktop and her physical desktop. She describes them as follows: ‘actually my [computer] desktop is a bit like a floordrobe and I have to sort through it’, while her physical space is clear. She believes she would be in a mess and ‘not know where anything is’ if her physical desk was untidy. She explains ‘I have an in tray which I tuck in a drawer and I put my in tray in there.’ It is as though the confines of the screen give Berenice a sense of everything being in one place, and easy to find through search facilities. Having objects retrievable in this way may free us from the need to create a physical order. However, Berenice’s digital filing system beyond the surface of the screen is impeccable, as she insists on creating a system that she can follow for storing files. She reflects: ‘I like a sequence and a logic.’

One point that emerges from my interview data is how the screen, in contrast to a physical desk, can act as a form of container for everything: tools, files and visual inspiration. It also acts as a conduit for whatever is needed, which indicates a significant difference for how we think. Charlotte Tate recognises how online availability is firmly part of her design process. She explains ‘I’ve grown up with computers and it’s kind of having a smart phone and being able to constantly go to the internet, so my way of thinking has probably always been that type of access, in comparison with having to look something up physically.’

#### **6.4. Concluding points**

Following on from theories of affordance, this chapter has drawn on theories of embodied cognition to investigate changes to design thinking and process in relation to technological change. In the light of understanding cognition as

a process, or system, that is not independent of bodily movement and external objects, I have considered the accounts of practising designers to highlight ways in which design process is affected by the use of digital technology.

As with any research based on theories of human cognition, little can be argued conclusively, because human consciousness remains incompletely understood. Even so, my participants indicate that the switch from a physical desk and conventional methods to digital ones has altered design process in ways that deserve further attention. Significantly, my research points to a shift in the balance between the degree of mental visualisation that takes place prior to direct engagement with any technology, and the kind of design conceptualisation that takes place in partnership with the available tools. I can argue that digital technology enables us to extend our cognitive process further; yet I could also argue that working with software and the screen to create ideas simply reduces mental effort. To an extent there appears to be a contradiction emerging. On the one hand, it looks as though pre-digital technologies encouraged designers to pre-conceive ideas in their heads. Yet, there is also a suggestion that traditional methods make us engage more fully with physical media in a way that is very much part of a cognitive process. Perhaps one way of making sense, is to bring back into the picture the sensory, tactile qualities of physical media and processes. Therefore, the next chapter looks at recent studies in the senses, and in particular, at what is currently known about haptic perception—that is, our sense of touch and of movement.





## Chapter 7. Haptic senses, manual skill and design process

*‘... only stones, flesh, stars, and those truths the hand can touch.’*

(Camus, A. *Summer in Algiers*, 1967: 151)

In the last two chapters I covered key theories of affordance and recent advances in cognitive science, showing a turn away from the long-held, dualistic view of the mind and body as separate entities. The essence of affordance theory is that the properties of objects suggest possibilities for action—which we perceive in relation to our physical attributes and abilities—while the essence of embodied cognition is that thinking cannot be understood as independent of our physical selves. Theories of situated cognition take this further with the argument that human thought processes are not just inseparable from our body, they cannot be understood as separate from the natural and man-made objects with which we interact. Both affordance and embodied cognition theory are concerned with perception—i.e., the mental processing of a raw sensation—with a difference that one starts from objects and the other from ourselves. However, what and how we perceive is dependent on how we actively and passively acquire sensory inputs through the use of our sensory organs. For instance, drawing a straight line by hand with a conventional pencil on paper generates a different set of sensations from creating a line in a digital document with a mouse or stylus. It is increasingly evident that our senses are more than simply suppliers of data for cognitive processing and that, in particular, our haptic senses (touch and movement) and our manual activities are profoundly bound in with thinking. In this chapter I draw on the field of sensory studies to examine how design process is affected by the switch to digital technologies, with a specific focus on manual engagement and tactile perception.

### 7.1. Sense, perception and cognition

The connections between sense and perception are not fully understood, but a distinction is commonly drawn between the two. Perception is defined as the

processing of inputs from a sensory organ such as a sound picked up by an ear, which might then be cognised (or interpreted) as the turning of pages in a printed book, for example. Yet it is increasingly thought that the boundaries between sensations, perception and cognition are not so clearly drawn. Through personal communication, professors of psychology and research colleagues Susan Lederman and Roberta Klatsky explained the distinctions between the two systems, while simultaneously acknowledging that the divisions between sense, perception and cognition are hard to pin down. Klatsky (2015) explained that:

[...] sensation is concerned with what the receptors and peripheral neural pathways deliver, up to the point of conscious experience [...] and perception with what the brain chooses to do with the information: discriminate, classify, etc. Where does cognition begin? There really is no obvious demarcation.

Joining in the conversation, Lederman (2015) added that psychologists used to maintain a different point of view: '[...] cognition was viewed as experiences that did not require the physical presence of the object (eg the memory of a pencil, etc.).' She continued '[...] more recent research has shown that cognition affects our sensations and perceptions, and vice versa. [...] I no longer think there are any clearcut boundaries, and that these experiences are highly interactive.'

Once again, this emphasises that what we generally think of as 'mind' may be limited. It also gives weight to the idea that what and how we sense through manual activity is closely bound up with what and how we think, making our manual skills an important factor. Wilson (1999) and others have argued that the human hand has been significant in our physical and cognitive evolution, referring to our capacity to manipulate objects and how this has altered the structure and capacity of our brains. Manual dexterity is highly sophisticated in humans, as Ritter and Haschke (2015: n.p.) point out in their study on hands and the brain. They refer to 'the richness of human dexterity, manual action, and its embedding in cognition', while also pointing out that our understanding of skilful motor activity and its connections with cognition has a

long way to go. While there is limited understanding of the interactions between physical actions, brain and mind, there is good reason to be confident that our manual activities and sensations are implicated in our thought processes more than we yet appreciate.

## **7.2. Studies of the senses, haptic perception and design process**

It has been recognised that human senses present a rich area for study and that research into our sensory system could contribute to a range of contemporary issues. Our relationship with the book in both tangible and intangible forms is just one; our interaction with different technological objects in the process of design is another. Recognition of the importance of our senses is demonstrated by the rise of research activity focusing on every conceivable aspect of our sensory system, extending the terrain beyond the realm of psychology—its more familiar home (Howes, 2013). In 2006, the expansion of research was sufficient to lead to the formation of a distinct, yet interdisciplinary field known as ‘Sensory Studies’ (Howes, 2013). The field has its own boundaries, but attracts scholars from many domains—all with affiliated interests in the mechanisms and experiences of human sensory systems. The sheer breadth of perspectives and research aims can be ascertained from a scan of the members of The Centre for Sensory Studies—a research association established at Concordia University in 2011. Its members represent disciplines as widespread as anthropology, sociology, geography and performance art, to name a few, and the associated projects range from the study of sensory experience in museums, to the history and culture of aroma. A significant number of studies are specifically concerned with the sense of touch, focusing on issues that range from consumer behaviour to the importance of tactile feedback for piloting planes or driving cars. This attention to touch represents a noteworthy change. The sense has been largely overlooked since the Enlightenment, as sight has predominantly been considered of a higher order through its association with mental acuity (Classen, 2005, Paterson, 2007). However, our digital—arguably disembodied—environments of virtual realities and intangible objects have raised the profile of touch, creating more interest in tactual experience. As historian Constance Classen (2005: 2) states, while we are surrounded by representations of touch, ‘there is often

nothing actually there to feel'. This lack of tangibility denies us an irreplaceable connection with the physical world, which has raised a number of concerns for the future.

The study of the senses within contemporary scholarship not only sits alongside a growing acceptance of a lack of a hard boundary between the sensory and the cognitive, it also coincides with a renewed interest in analogue processes and physical objects. This is apparent in changes in retail sales and trends in consumer preferences. The revival of vinyl records for recording and listening to music is often cited as an example of attraction to the analogue, but there are other examples of interest in non-digital technologies and objects, such as a rise in sales of notebooks, indicating a growing preference for pen and paper as a means to record information or ideas (Sax, 2016). Such a vote for the analogue, or the physical, cannot simply be dismissed as a form of nostalgic sentiment; rather, it implies that physical processes and tactile objects (such as printed books) offer something that digital counterparts lack. Even with music, it is thought that the act of handling a physical, vinyl disc as opposed to clicking a 'play' button can enhance the experience, if only because the technology encourages us not to skip through tracks. Reasons for such a turn may include a desire for ownership (Paterson, 2007; Bowker, 2008), but it brings us back to issues of the value of manual engagement and material, tactile qualities. Touch, both passive and active, is crucial for our interaction with physical objects and even our apperception of ourselves as physical beings. Yet, in spite of its core role in our lives, touch is neglected in the use of digital technology. As Classen (2005: 2) astutely remarks, touch is 'the hungriest sense of postmodernity'.

### **Haptic perception: touch and movement**

Combining this interest in the sense of touch with Wilson's connection between manual activity and cognition, I now look more specifically at the use of our hands. What we sense through manual engagement, or any direct, physical contact with objects, is not limited to touch but includes bodily movement. Together, these form what we know as haptic perception. Lederman and Klatsky (2009) explain that the current, commonly accepted view of haptic perception is that it is made up of two systems—the cutaneous and the

kinaesthetic, which we can also think of respectively as touch and proprioception. The cutaneous system consists of receptors (neurons) located in our skin which detect touch sensations through pressure and temperature, while our kinaesthetic system consists of receptors found in muscles, tendons and joints, which detect physical movement and position.<sup>1</sup> Through the combination of touch, movement and bodily position, we acquire a sophisticated array of sensory information with which we gauge the various material qualities of objects and surfaces, and from this, perceive more possibilities than we might perceive through vision alone. To understand this better, I suggest thinking of how we can eat soup with a spoon successfully, even when our eyes are closed. While both types of receptors are found in the skin and muscles throughout our body, we tend to associate touch with our hands, and for good reason. It is with our hands that we actively grasp and touch objects, explore the environment, and carry out refined actions. While our interaction with the world would be dramatically altered with the loss of sight or hearing, in Paterson's (2007) view, without our haptic senses we would have no world at all. It may be the sense that is hardest to imagine existing without, and yet digital technologies have made possible virtual environments and objects that are intangible, with an impact on our sensory experiences.

Lederman and Klatsky (2009) see haptic perception as complex, affected by a number of different factors and different types of processing. For this reason they prefer not to distinguish between a sensation, a percept or cognition, which again supports the notion that all three are implicated in what we conceive as 'mind'. Usefully, their work provides a way of understanding how the parts of the haptic system work together. They achieve this by dividing perceptible properties into two categories: geometric and material. The former indicates size and shape as detected by the kinaesthetic system, and the latter covers other qualities such as texture, temperature, rigidity (or compliance), which are all sensed cutaneously. The sensory information that designers gather from their interactions with digital technologies is different from the kind of sensory data that arises from working with traditional tools. Given the interconnectivity of sense, perception and cognition, it is therefore likely

<sup>1</sup>. Proprioception works in conjunction with our vestibular sense (balance).

that for designers, digitisation affects design process by altering the complex relationships between hand and mind, or between sensations, actions and thoughts.

### **7.3. Haptic senses, digital technologies and book design**

It is evident that our haptic system, and particularly our sense of touch, have become key areas of interest within many fields of research. Yet, in spite of this attention and the amount of new literature on the topic, cognitive scientist Martin Grundwald (2008) asserts that our touch sense is still little understood. It is not only our comprehension of touch that appears underdeveloped. Neuroscientists are now purposefully reviewing what is known about the sensory system, challenging the Aristotelian notion of five senses and in some cases, arguing for the existence of as many as 33 (Fairhurst, 2014). This is easier to grasp if we recall that touch can be broken down into different pathways that distinguish between sensations of temperature, pressure, texture and even pain. However, no matter how many individual senses we identify, studies inform that our senses do not work in isolation, but work both in co-operation and in contradiction (Paterson, 2007). An example of contradictory sensory information is provided by book designer Peter Guy. In an interview conducted by Judith Bastin in 1977, he talked about the right relationship between size and weight. He explained that people expect a certain weight when they pick up a book they are looking at. With ‘nasty feather-weight papers [...] they look like big books when they are not [...] when you go to pick one up you expect it to weigh quite a lot and hit yourself on the nose, because it is so light in relation to its bulk’ (Bastin, 1977: 40).

How a book looks is of course as important as how it feels in the hand, but, as Guy points out, good design requires that the two work in harmony. Alongside a visual sensibility, haptic senses and the development of manual skills have always been part of book design practice and process, but the switch to digital technologies has inevitably brought changes to the type of manual skills designers acquire and require, and to the degree of direct contact with physical materials. It therefore makes sense to consider the impacts of digitisation on the process of book design from the perspectives of touch, proprioception and manual skills, for the following reasons:

1. Printed books are essentially tactile, tangible objects which are held, felt, and manipulated manually. These qualities and the form of engagement they provide have been foregrounded by their contrast with digital forms. Prior to digitisation, the material qualities of a book were clearly integral to its design and to the design process. However, through their effects on both the publishing system and the design process, digital technologies have arguably altered our connection with what book designer Dale Tomlinson describes as ‘the materials side’ of book design. For a designer working solely on a computer, the physical and tactile aspects of a book and the materials of production are less directly and immediately part of the process. This change in direct physical contact with the materials of the book is worth investigating.
2. Digital and non-digital objects are tangibly different. We cannot meaningfully touch a digital object or entity (that is, a sequence of bits)—we can only handle the device through which we access it. Given the links between our sensory and cognitive systems, it follows that this difference is likely to have consequences for how we think. Whether an electronic book is accessed via a desktop computer or a handheld e-reader, both technological objects inevitably restrict the limits of our haptic perception. They are only capable of providing the same tactile and kinaesthetic information for each and every book, leading to an inability to make any tactual distinction. This lack of haptic variation is also predominantly a feature of a design process carried out using computer hardware and software.
3. Tacit knowledge—i.e., what is known but cannot be articulated—is acquired through the experience of doing, including what is known through the cultivation of manual skills. For book design, such tacit knowledge includes an understanding of material limits and possibilities of the kind that comes from physical engagement. As we move exclusively to digital technologies, knowledge acquired tacitly through manual engagement could be lost, being replaced with what might be called digital tacit knowledge, where our hands become adept at manipulating digital tools. It is useful to consider the consequences of such a change.



4. As sales of print books revive, there is evidence of changing appreciation of the material, tactile qualities of printed books, shown by both producers (publishers) and consumers (book buyers). While this is discussed in more detail in chapter eight, it suggests that we should carefully consider the direction of book design and the purpose of design processes that include direct, hands-on connection with physical materials and traditional methods.

#### **7.4. The hand: touch and manual dexterity**

To recap, manual engagement and tactility are inseparable from our long-term relationship with the book in printed form. A book is not only looked at, but handled and felt, and in this way both visual and tactual elements are necessarily intertwined in the act of communication. The visual and the tactile combine not just for the purposes of producing an aesthetically pleasing object: manual, tactile engagement is a factor that is increasingly thought to affect how we read, comprehend and recall textual matter (Mangen, 2016). If this is the case, it adds to the reasons why designers might benefit from practical knowledge and experience of the materials that make a book. As designer Dale Tomlinson points out, there is a relationship between the design of a book and the materials of production, and an appreciation of the way book materials handle and feel should be part of design process. While this is not in dispute, the digital design process and digital environment arguably distance designers from tactile properties and material processes and, in so doing, may de-emphasise the contribution they make to the value and functions of a printed book. Elements of traditional practice might help maintain not just useful manual skills, but also keep tactile qualities in mind. Whether it is possible to recall a tactile sensation once experienced is an area about which little is known.<sup>2</sup>

On this point, the designers I interviewed indicate that they remain very much aware of the book as a physical artefact throughout their design process. Although they accept that digital technology in some ways disconnects them

<sup>2</sup>. During his visit to Cambridge in 2015, I met with psychologist Professor Spike Lee to ask about memory of tactile sensations. He was intrigued by the idea, which we discussed, but he told me that he knew of no research in that area.



from physical materials, they acknowledge how much they consider tactile qualities to be important. Book designer and erstwhile publisher, Geoff Green, shows awareness of people's response to printed books, believing that for general book buyers, it is the act of handling a book that immediately determines if they like it. He comments: 'They [book buyers] don't know why, but they like it. Nothing to do with the content, I'm talking about the feel, and the look of it. It's pleasing to them.' Geoff's viewpoint can be linked to studies which have shown that handling an object for as little as a few seconds develops an attachment, which makes customers more likely to buy, or to value an object more highly (Wolf, Arkes, Muhanna, 2008).

As part of his process, Geoff keeps in mind a buyer's first sensory response to a book he designs. He is sensitive to sensory attributes himself, commenting 'The ink, the glue of the binding – all of these things are part of the book experience. [...] one book I did in the early 80s, full bound in leather, printed on an American paper – Mohawk – and its smell is so delicious, something like the aroma of a high-quality wine.'

Another participant, Alistair Hall, refers to the book as a container, saying 'As designers we care about the container, or the way the container enhances or adds to the content.' Although he does not emphasise the tactile qualities over the visual at this point, by using the term container, he clearly thinks of the book as a three-dimensional object. Book buyers also appear to care about the container; the recent sales statistics for ebooks and print books suggest that a book which can be physically held, manipulated and kept has a conscious and unconscious appeal and a value that extends beyond its content.

Designer David Pearson similarly thinks of how a book feels nice in the hand. The shape, size, weight and texture of the pages all contribute. He also believes that people appreciate a book's typography 'in a mild way', because 'it's another part of a book which if it is done well will add up to the book feeling like a very nice object and a pleasing thing to hold.' Although the text typography is sensed and perceived visually, David links the contribution made by good typography to the overall feeling that a book emits. In this context the term 'feeling' is unspecific in that its meaning is not limited to

tactile sensations, but it indicates a collection of sensations which together lead to an emotive response when we handle a book.

Charlotte, the youngest of the participants, also wants a book to have ‘a nice feel’, yet she also states that the look is more important to her than the tactile qualities. Here she is referring to the actual tactile qualities of a book, but she explains that for her employer, The Folio Society, the aim is to publish books with ‘the most luxurious feel’. In this case, her use of the term is similar to David’s, referring to the overall response that a book evokes. To achieve this, she says that time is taken to design each book as an individual project and that care is taken with the binding and choice of paper. While she works entirely on screen, she is often in contact with the binding designer to create a book that has a unity, and states that ‘we want it to look like it has been designed and considered as a whole.’ By keeping a connection with the binding department, she reflects that this can ‘inspire’ her concept design, as she may want to ‘reflect display faces or bring elements into [title pages] or pick out something that I could use.’ In this way, although she is not responsible for certain material aspects of the book, they feature in Charlotte’s design in a distinctive way, in line with the priorities of her employer—a publisher that insists on linking container and content.

### **Manual engagement**

It is easy to see how physical processes connect a designer to the material aspects of a book. This is evident with David Jury’s experience of working with letterpress. He reflects on the differences between letterpress and digital process:

... with a letterpress book you are thinking about the whole book all the time. Because when you make those decisions about the paper for instance, you are immediately thinking about the weight of the book and the weight of the paper. And you turn the page – you need to know the paper will behave in a certain way. If it’s a horizontal book for instance, the paper needs to be heavier because you’ve got a lot more ... with a larger book ... if the paper is too light it doesn’t behave in the right way when you lift it. With

a digital book for the reasons I've explained, those choices are taken away. With letterpress you can do any size book, you are much more aware of those physical attributes. And because you've got to think about the turning of the page, you then start thinking about the binding and how that's going to work. You think about the cover ... with a letterpress book you are aware that it is a physical object.

David believes that digital technology has removed certain choices, but his reflection reveals more that the technology reduces the degree to which designers are presented with limits and conditions, in comparison with those that arise when they work directly with the materials of production. It appears that the physical process provides the connection between the mental and manual more acutely than we experience with design software and digital bits.

As mentioned above, unless we have a physical impairment, it is with our hands that we actively explore our environment, and actively manipulate it. Both exploration and object manipulation require information from our entire haptic system—i.e., both touch and proprioception (kinaesthetics). It is through the use of their hands that book designers manipulate their tools—whether those tools take the form of a keyboard, mouse and digital pen to activate instructions, or as was once the case, pencil, ruler and scalpel to make marks, scale, cut and paste. While our hands are still the primary means of working for designers, there is a difference in the functions and manipulations of digital tools compared with non-digital tools, as well as an undeniable difference in the quality of tactile experience, or feedback, that each provides. In other words, the information gained through our proprioception (cutaneously and kinaesthetically) is changed. Pinpointing the consequences of such a change for the ways we think is not a simple task, but interest in the connections between manual dexterity and knowledge is growing. For example, although from different backgrounds, both Matthew Crawford (2009) and Richard Sennett (2008) have investigated the value of working with our hands and with physical materials in comparison with working with computer technology. Crawford (2009: 5) sees a danger in the digital environment, which in

his view leads to ‘manual disengagement’. For making books, such disengagement is a negative. Designer David Jury reminds us of the importance of manual engagement. He explains that in the act of turning sheets of paper ‘you get the weight of the paper, so you get a sense of what you see as you turn the sheets of paper.’ Again, mocking up a book to see and feel how the pages turn is not impossible with digital technology, but it does not encourage us to do so. For Crawford, manual engagement is also intellectual engagement—a view that is clearly connected with the turns in cognitive science discussed in chapter six. The relationship between manual and intellectual is also a view held by the architect Juhani Pallasmaa (2009) who shares the idea that knowledge is gained and held in our hands. Although his design field is a more complex one, there are overlaps with the process of designing a book in that the final outcome is three-dimensional, and to be successful, should provide more than functionality. A building is a place to inhabit—a parallel we could draw with a book. In Pallasmaa’s view ‘the hand often takes the lead in probing for a vision, a vague inkling that it eventually turns into a sketch’ (2009: 17). He goes on to describe holding a pencil ‘as a bridge between the imagining mind and the image that appears on the sheet of paper.’ His point makes sense if we understand it as the experience of the imagining mind and imagining hand working interdependently, yet also with a degree of autonomy. This might arguably apply equally to working on screen with a mouse or a stylus, in spite of the comparatively restricted use of the hand that these tools impose. My participant Alistair Hall might agree. In describing his own process, he notes that ‘I’d be limiting my ideas if I just worked on paper, I’d be rejecting stuff because my draughtsmanship is so rubbish, whereas actually by having the tool that is more sophisticated I can try stuff out and think wow, that’s doing something interesting.’ For Alistair, the mouse is his way of ‘probing for a vision’, yet in his case, this seems to be linked with the comparative degree of precision that he can achieve with digital tools, and his relative lack of mastery of working with traditional tools. Even if for Alistair the digital tools are functioning in a similar way to that of a pencil or pen for Pallasmaa, or another physical tool for Crawford, I suggest that there are differences. Recalling Hayler’s conditions for what makes an object technological—i.e. a level of expertise—we might say that for Alistair, pencil and paper are losing some of the functions of technology. Through the kind of skills

Alistair has developed, the digital tool provides more connection between mind and hand than traditional ones. But this may not be without a loss.

Designers who use ‘the screen’ for all stages of the design process are still manipulating tools with their hands and are therefore involved in a form of manual engagement. Yet, typically, when we become fully adept at using them, tools become extensions of ourselves. Heidegger famously demonstrated this idea with his analogy of the use of a hammer, where in competent hands, the user focuses on the nail being hit rather than the hammer in hand. Similarly, Merleau-Ponty used the example of a blind man perceiving his environment through the use of a cane, which acts as an extension of his arm (Flynn, 2011). This ‘readiness-to-hand’, as Heidegger described it, is no less true with the use of digital tools, which—with skilful use—can also disappear from our awareness. Yet, the mouse, graphics pen and keyboard do not have the same direct, physical connection between our hands and the object we wish to manipulate, creating an interruption, or a spatial gap between the effect of the tool and our tactual sense of it. A mouse is essentially a device for pointing at whatever object we intend to have an effect upon, which then allows for a change to be performed via other point-and-click instructions. Although bodily movement is involved in this act, our sensing and perceiving is more dependent on visual feedback. The mouse and screen do not provide information about material properties such as weight, density, flex and texture (Klatsky and Lederman 2002) and it is hard to see how this loss does not diminish our capacity to think in a holistic way when designing a book. Hewson (1994) is right to point out that the tactile and visual dimensions of the media used in tackling a design are intimately entwined, something that is excluded when designers work solely on a computer.

### **Tactile feedback**

The importance of tactile feedback for many activities is increasingly appreciated, and is a quality which companies such as Apple recognise needs to be addressed to achieve more effective and satisfying use of its devices. The introduction of styluses that work with touch-screen technology is an attempt to provide a user with a sense of direct contact through haptic perception. The Apple Pencil is one example, specifically designed to detect pressure and

changes in direction, as well as to replicate the physics of holding a traditional pencil. Apple describe the device as ‘[resembling] a classic writing tool’ and state that ‘[it] lets you jot down notes and sketch ideas as naturally as you do on paper.’ The degree to which this is achieved is questionable. Although the developers have made vast strides, enabling actions that are more akin to manipulating traditional pens and pencils, the surface differences between paper and screen are not a trivial matter. The flow of ink on paper, for instance, is dependent not only on the user’s sensitive handling of a pen, but also on the textural surface of the substrate. The viscosity of ink, the hardness of a pencil and the roughness of the paper all contribute to the feel of working with writing and drawing technologies (Jungchul Kim, et al, 2011). So, while a stylus may provide the opportunity to annotate a design or make a series of sketches at speed, replicating intricate haptic sensations typical with conventional media can only be approximate. Calligrapher and designer Sebastian Lester is experienced at working with both traditional pens on paper, and an Apple pencil on an iPad. As a master in his field, his insights into the limits of each are valuable. He comments ‘Writing on an iPad with an Apple Pencil feels very different to pen and ink. The Apple Pencil slides across the iPad’s sleek surface which doesn’t feel as satisfying or natural as to me using a pen and paper.’ He refers to the ‘natural’ and ‘intuitive’ use of traditional tools, and concludes that currently, digital tools ‘don’t behave naturally’ and lack the ‘tactile qualities of pen and paper amongst many other things’ (Lester, 2018). Again, this highlights that digital tools are not a perfect substitute for the more direct experience provided by traditional drawing implements, and also points to the acute sensitivity with which our hands pick up sensory information.

### **The effects of digital tools on manual engagement, attention and experimentation**

While haptic feedback provides information about material qualities, manual engagement contributes to all forms of knowledge in other ways. Book designer Warren Chappell saw ‘A generation of writers, readers and even typographers that have no manual connection whatsoever to the shapes of letters’ (Chappell and Bringhurst, 1999: 277). For designers, this connection was a natural part of a process which required a certain amount of type to be hand

rendered. The disconnection that Chappell describes is intensified by digital technology, which eliminates the need to draw letterforms with any degree of precision, or even at all. In his comment, Chappell is alluding to a benefit of hand-rendering type that is now largely lost—the attention and dexterity that such drawing encourages and develops. It is likely too that carrying out this kind of activity with our hands imprints the details of type on our memory. Many of my designers have a background in working with pre-digital processes involving pencil-drawn type and layouts, but now see little point in spending time on an activity that can so easily, speedily and more precisely be executed with digital tools. The ability to ‘zoom in’ to magnify type on screen enables details to be visually scrutinised, but the act of drawing letterforms leads to another level of familiarity through manual action. We should not underestimate the sensitivity of our haptic senses, and how they inform.

Another side-effect of computer technology is suggested by type designer Jean-François Porchez (Porchez, 2002, cited in Rigley, 2005). He notes a difference in how students work when they use digital tools only, offering the analysis that ‘Today students are sat in front of computers all day, they have lost their ability to play with their hands ...’ This sense of play through manual activity harks back to recent theories of affordance and how our hands are used for exploration; it is also an attribute that has been linked to the use of physical processes such as letterpress and its impact on design thinking, or know-how. As the authors of the 6x6 Letterpress research project comment: ‘The recognition of the value of letterpress in relation to the development of typographic knowledge is progressively evolving into the realisation that workshop environment actively promotes experimentation’ (Cooper, Gridneff and Haslam, 2013). For experimentation, we could also choose words such as play, or even freedom. In a similar way, my participant David Jury, who is a designer, typographer and letterpress printer, talks of the attractiveness of letterpress work in terms of a liberation that he thinks is linked to its physical, tactile nature. Although recognising that design software provides freedom in the form of the control that it enables (in comparison to the earlier phototype-setting technologies) he described letterpress as providing ‘something in addition to that freedom. And I think it is a physical thing – the object that you have in front of you is a very beautiful thing.’ Although David is not explicit,



I understand him to be referring to a connection between the process and the kind of sensory experience that a digital process lacks.

If we think back to Crawford's ideas about manual work, we might also think of this sense of liberation as related to the combination of physical and intellectual engagement. In describing their work in their letterpress studios, both David Jury and Phil Treble refer to how much they are physically active in the studio, and how their knowledge is acquired through simply handling physical type, papers with different textures, and adjusting a press to optimise performance in relation to each project. This knowledge is not simply technical, but extends to a deeper understanding of materials and space. Like tacit knowledge, it is acquired through practical experience. Book designer Susan Wightman appreciates the value of her background and the knowledge she has acquired through hands-on, practical experience. She reflects:

I also started off doing everything by hand. We weren't allowed to use computers at college so it was hand-drawn lettering and letterpress. And learning letterpress first before you get on a computer has a huge effect on how you design things, because you are actually physically handling space. You don't even do that when you are drawing, but you have to make decisions about space because you have to pick up so much lead and you have to make decisions about how you justify everything. Nothing is default like it is with a computer. You had to decide every single thing and physically move it around. So I think that had a huge effect on my work.

Although much younger, Charlotte is in complete agreement. She considers how her university experience with letterpress has influenced her computer-based design. She states:

... for me I think it gives you a really good ground of knowing how typography works. ... you really appreciate how kerning works, how typefaces look in relation to each other. You really get a better understanding of typography as a whole ...



In line with the findings of other studies, my participants believe that experience of physical processes has affected their knowledge and their current processes, yet the reasons for this are never exactly clear. Susan identifies a relationship between handling an object (in this case, physical type) and her understanding of space. An appreciation of this connection is helped by drawing on Paterson's account of how people once measured distance or space in relation to their own bodies. Manipulating 8pt metal type provides a more profound grasp of size than can be ascertained from viewing 8pt type represented on screen, where type is not necessarily represented at actual size, and cannot be felt. In addition, with digital technology, a designer specifies size by entering numbers via a keyboard. By thinking of size and space numerically creates distance from a physical form of knowing—even though we may have a cognitive idea of what this represents. Paterson summarises this difference well, by describing the change as a switch from 'aesthesis to mathesis' (Paterson, 2007: 60).<sup>3</sup>

### **Pre-digital processes: friction, inefficiency and imperfection**

There are other factors to be considered in relation to the use of technology and the sensory aspects of design process. The lack of perfection and comparative inefficiencies that are inherent in manual work with traditional tools may contribute to design process in ways that are lost with digital tools. Geoff Green has had a long career in book design and can still describe his pre-digital processes vividly. He is not nostalgic or sentimental about pre-digital technology, but he can recall in detail what it was like to work with the traditional tools of the trade and recounts this with noticeable richness.

... you had to mark up the manuscript very very carefully, writing on the sizes or whatever was required. ... a design on paper with carefully drawn out letters on these layouts so that the line of caps with the headings were supposed to look like the type it was being set in, not something arbitrary. And that was in the days of the dreadful rapidiograph – you could measure the time in hours that

<sup>3</sup>. Paterson (2007) explains that the origins of the term 'aesthesis' is rooted in sensing and feeling.

you spent shaking the damn thing to make it work. But that's just the way it was. And incredibly detailed specifications. And in those days, as well, the designer was very much involved in the whole process of the book, which they are not today. When you designed a book at that time if you chose Bembo for the text face, you would then have to carefully ask, or think about what paper it was being printed on. Because if you put Bembo on an art paper it would look too thin, you needed to put Bembo onto a laid paper because then it could be thumped and so on.

He adds more, describing and evoking the material, tactile qualities of the tools:

I tried so many different things, tracing paper, layout paper and then this wondrous stuff, plastic – like paper but plastic, it had a lovely surface, and your rapidograph would go on it, and one side of the sheet was slightly rough, I don't know, not really rough but you could write on it. And the other nice thing was you could scrape off the errant line with a scalpel.

This process is familiar to anyone with knowledge or experience of book design prior to digitisation, but through his account, Geoff reminds us of the extent to which the physical attributes of the book materials (i.e., the paper colour, weight and surface texture) and design equipment (e.g., how a pen works on a particular surface) influenced both the design decisions and the process itself. With computer software, reversing a mistake has much less cost in terms of time and negligible cost in terms of resources, and the temperamental nature of a pen is no longer something that needs to be accommodated. The friction that was associated with traditional design tools, and the imperfections from manual actions that were so abundant in earlier processes is reduced, if not eliminated, with digital tools. This has obvious advantages, yet the efficiencies and perfection that can be achieved have some negative aspects. Technology writer Evgeny Morozov describes the 'digital straightjacket' that is created by Silicon Valley, as it seeks to achieve optimal efficiency and perfection (Morozov, 2013: xiii). Yet, Morozov argues, it is the

qualities of ambiguity and disorder, opacity and the possibility of error that characterise our sense of freedom. This may partly explain why my participants Phil Treble and David Jury, feel liberated by their letterpress work—a process which affords the qualities Morozov commends.

While the hand is an instrument that can work with remarkable dexterity and precision, there will always be an irregularity. This may be perceptible only at a subliminal level, but it is a quality that is registered and avoids a sense of repetitive monotony. It also avoids what writer, designer and artist Donath describes as the ‘sterile cleanness of the digital’ (Donath, 2011: 303). This is something that David Jury is aware of, as he indicates through his idea that ‘what we crave is that element of not quite there, which tells us it was done by hand, done by this wonderful process that can never be quite right.’ For Alistair Hall, these imperfections are also desirable. He reflects:

... there’s that feeling that if something is going to be replicated identically it has no personality maybe, no history and the joy of something physical and printed is that nothing is identical ... I think that as a species we respond to those little glitches that show that something is going on, something has a difference, a personality to it.

While these comments refer to the appeal of physical objects, the kind of sterility that Alistair alludes to may have relevance for design process. Designers strive for the best possible aesthetic and technical outcomes, but this is not necessarily synonymous with perfection. Book designers may even enjoy the transformational process from hand-drawn roughs to the finished, polished outcome that is evidenced by a paper trail, or where a tension exists between the processes and final outcomes. Dale Tomlinson remembers the combination of anxiety and excitement that would accumulate before the typeset galleys came back, following his written specifications and hand-rendered layouts. He states:

I think I used to get a buzz when the proofs came back from the typesetter. I used to get really excited about that. I’d spent ages

doing the mark up, obviously done a few sketches. So this bundle of proofs arrives on a Friday morning or whatever and I couldn't wait to get them open. To see if my design had worked in the way I thought it would. Also, something satisfying about seeing it properly typeset, especially if they'd done it right. Which is great. I do miss that aspect of it.

By contrast, there is the possibility that working with traditional tools helps to reduce potential flaws, although in this case, they are not flaws associated with the traces of the human hand at work, but those associated with the exploration and perfection of an idea. I discussed earlier the tendency to work through fewer ideas when we use only digital tools, and how this is encouraged by the quality of precision that digital technology offers effortlessly. Design software requires more effort to capture the quality of a quick pencil sketch, which rather defeats the purpose and value of it. Recalling the findings of Hewson, Bilda and Demirkan covered in chapter three, the semblance of perfection with digitisation seems to shorten the exploratory stages of design, of the kind that rough-and-ready pencil sketches invite. Susan Wightman is aware of how alluring a digital sketch can be. She says: 'I can understand that [less exploration] being the case because what you are seeing on the computer looks so close to a finished thing, that I think it would be easy to produce a page of type and carry on going.' However, her work partner, Michael, finds it easier to 'do rapid sketches but on the computer', adding that '... you cannot sketch margins accurately'. He describes his screen-based method: 'I'd start off with an A3 sheet, draw out various formats and fiddle around'. His comments indicate that he prefers a degree of precision from the outset to a looser form of exploration—an approach that is a direct contrast to Geoff Green's. Geoff is one of the few interviewees who always begins on paper. He states '... I still draw out. I get a piece of A4 paper [...] and I draw on the back the trim size and the margins. I always do it on paper first – I find it helps me to visualise those spaces far far easier than on screen.'

### **Tactile engagement and manual skills**

Digital technology has changed the manual skills we need for book design and our range of sensory inputs, altering the balance and relationship between

the manual and the mental. My participants indicate that direct engagement with physical materials, using all their senses, is the most obvious part of the process that has been affected. This is apparent in the way in which my set of designers assess their work at each stage. They demonstrate varying, but certainly diminishing reliance on ‘hard copies’ of their digital pages as a way of judging their typographic choices. In the past, working on paper, ways of judging work naturally relied more on viewing pages from different distances—out of hand’s reach, or ‘walking around’ as Simon Loxley mentions—and through handling physical mock-ups. For a few of my participants, this practice remains key, while others consider it to be unnecessary. Simon Loxley falls into the former category. He is aware of the value of ‘printing out things fairly early and laying them out and having a walk around it’, looking and thinking, but believes this is ‘a process that gets lost with digital’. Susan Wightman and Michael Mitchell also rely on hard copies for making good judgements. Susan speaks for them both advocating that ‘there is a case for saying that when you design something on the computer, you really have to print it out and look at it. It is exactly the same with editors who I am sure edit differently with a pen in their hand to editing on screen.’ This, Michael contributes, is to do with the connection between mind and body. ‘You make a mark on a piece of paper and you relay, you click a button and you don’t relay.’ The suggestion is that the acts of hand-writing and hand-drawing require different attention, which is a point made by designer Berenice Howard-Smith. When I asked if she thought she had lost anything in the switch to digital work, she commented ‘Oh, dexterity and attention to detail.’ She added: ‘I think that each time a technology gets better, you lose more attention to detail.’ Expanding on this point, she went on to explain:

You have to ... try very hard as a designer, I think perhaps more than other professions, you have to sit and think this is what I’m doing, I’m in the moment, my feet are on the floor and I’m sitting here doing this. Not wandering off listening, or aware of someone else’s conversation, I’ve got to concentrate solely on this. That’s quite hard. Because actually you can do things very much by rote, unless you are really careful.

Dale, however, prints out his designs very rarely. He admits ‘The other thing I don’t do that often these days is print stuff out.’ He is confident that he can get it right on screen through zooming in and out. However, he does express a doubt, acknowledging that this ‘makes me think I’m capable of doing it without referring to a print-out.’ Thinking it over, he adds ‘It does make a difference. When I do print out, I have to trim it down and slide it into a book of the same size, pretend that I am flipping through it.’ In this way, Dale is not simply using a physical copy to assess its visual qualities, he is turning it into a three-dimensional object to evaluate how his page design works in the hand, extending his awareness of how it looks from different angles. This links with Geoff’s comment that regardless of the technology, ‘it is only when you see – and feel – the finished item that you can then comprehend if it has worked or not.’

Susan Wightman is very conscious of the three-dimensional nature of any book she is designing and how it should feel in the hand. For this reason, she explains her need to have something physical to work with.

I think that when you are thinking about the format of the book, you want a dummy in your hand. You want to actually feel the size of the pages, you want to feel how heavy it is, how thick it is, and how heavy the paper is. So, I think at that time you are thinking about it and we would always get dummies made if we are handling the print ...

Susan indicates the value of having a physical model that can be held and touched when designing a book. She specifically refers to sensing the weight of paper and, more surprisingly, to judging the page size through feeling rather than seeing. By handling a physical mock-up, we can assess the sensory relationships between different parts of the book as well as the individual components. For instance, in addition to knowing how a particular paper feels, a designer might want to assess the weight of the pages in comparison with the weight of the cover boards, or how both are in harmony with the overall size. In an unpublished interview, book designer Peter Guy explained this connection clearly, saying that a printed book ‘...should feel right in the

hand with the right weight and size ratio.’ As he concludes: ‘Books are three dimensional things and they should have a nice balance and feel right in the hand’ (Bastin, 1997). The aim of a designer is to achieve congruity, not dissonance, in a reader’s sensory engagement with a book and for that we need to draw on our own haptic perception. Correspondence between materials cannot be ascertained visually alone, or even by drawing solely on prior knowledge. In other words, there is no substitute for physical contact with book materials for holistic design.

There is one final point that can be made about the impact of digital technologies on design process through changes to manual activity. In his writing on craft, Richard Sennett (2009) defines skill as a practice that is acquired through training—a definition which has clear links with the notion of tacit knowledge. The skills and know-how that book designers have acquired through the development of manual skills do seem to have an effect on design process. Of course, digital tools also require skills which are developed through many hours of practice and trial and error, but, as discussed, there is a difference in the kind of manual dexterity and control that comes from mastering the use of traditional design tools. Alistair Hall and David Pearson have less experience of traditional methods than some of my older participants, and both consider their drawing skills to be inadequate for working non-digitally. Alistair describes his draughtsmanship as ‘rubbish’, and David talks of his inability to draw. David believes that this makes him avoid certain ideas, which leaves him with ‘the ability to make pictures out of type.’ In the digital environment, type can be manipulated in ways that vastly outstrip what is possible with physical processes, making the creation of an image possible without needing particular hand skills. Like Alistair, David exploits the advantages of digitisation to create designs that he might otherwise not pursue because of the manual skills that would be required.

## **7.5. Concluding points**

The theories outlined in the preceding chapters open up the possibilities that our cognitive system is not simply a processor of sensory data, and that human consciousness is not solely located in the cerebral cortex (Damasio,

2018). This perspective on cognition has underpinned this chapter, where I have focused on physical engagement with respect to manual skills and haptic perception, in to explore further the impact of digital technologies on book-design process.

Wilson (1999) and others have argued that the human hand has been significant in our cognitive evolution, drawing a parallel between our ability to manipulate objects and the development of our brain and intellect. It is predominantly through our hands that we explore the world, gaining information through the senses of touch and movement. The switch from pre-digital to digital technologies has led to a shift in manual skills and haptic interaction, with implications for the process of book design. As the printed book is ultimately a tactile object, how it feels in the hand is important for designers and needs careful consideration. The move to digital technologies inevitably reduces designers' direct manual contact with physical, tactile materials during the design process, and develops different manual skills from those required with pre-digital technology. Physical contact with materials encourages a designer to remain aware of an object's tactile characteristics, keeping in mind how these affect how a book feels in the hand.

By drawing on the accounts and reflections of practitioners, I have identified a number of areas that are of interest. These range from the degree to which designers remain very much aware of thinking about the material, sensory qualities of the printed book, to the value of friction in design process. My participants have contributed in different ways to the question of change relating to digital processes, yet overall, they indicate again that earlier technologies lead designers to develop an ability to visualise and think through ideas before executing them using the computer. With less of this experience, the screen tends to take on the role of rough sketching, even though that rough stage appears much more polished than a pencil and paper version of the same design stage. For designers with a long background in working conventionally, the screen is for working with a design that is already somewhat mentally pictured.

As a final point, although my designers see all the advantages of working with digital technologies in the making of a book, they all demonstrate their con-



nection with, and preferences for the book in its printed form. This leads on to my final chapter, on the notion of materiality and human relationships with material things.



## Chapter 8. Materiality, material culture and designing the physical book.

If analogue culture is often characterised by the concrete, digital culture is characterised by the intangible. Digital technologies have refreshed our vision of the solid and the tangible, leading to a recognition and re-evaluation of the place that physical objects and materials have in our lives. I suggest that concreteness and tangibility are, to an extent, symbiotic products of the virtual world and, as a result, we have become more aware of the significance of these qualities. In other words, by challenging our ideas of materiality and thereby highlighting the role of the physical, digital technologies are arguably altering our relationship with tangible artefacts and the value we attach to them. This change is notably the case with the printed book and other print publications, where the existence of electronic forms have drawn attention to the benefits of the qualities associated with print, such as fixity, durability and tangibility. This also draws attention to the attributes and function of book typography and other aspects of book design. The recent revival in the sales of printed books and, in some cases, investment in higher production values, is indicative of this turn, as ebooks show their limitations.<sup>1</sup> It is notable that figures released at the current time of writing (2018) show the trend that print sales are rising while sales of electronic books are in decline (Publishers Association, 2017). Yet, if we are witnessing any degree of print renaissance, it is surely rooted in the effects of digital technologies (Sax, 2016: 105). As designer David Jury points out, ‘digital has put pressure on books to be more physical. And it’s the physical aspects of books which I think people are exploring more than anything else.’ But, do digital design processes fully support this?

1. For an example of high production values, see Chris Riddell’s book *Goth Girl and the Sinister Symphony*, published by Macmillan Children’s Books, 2017. The cover is printed with a special black ink, has foil blocking, and includes a mini-book inserted inside the back.

Engagement with physical materials and objects, and the effects of digital technologies in this respect, is the thread that runs through this thesis. In preceding chapters I considered our interactions with technological and non-technological objects from a range of philosophical and psychological perspectives, to identify their capacity to affect how we think, perceive and act. In each case, from this basis I drew on my interview data to look at how the change to digital technology has consequences for the process of book design. In this final chapter, I focus on the question of materiality and consider how much the material qualities of the printed book remain at the heart of design process in the digital era. As with the preceding chapters, here I discuss my interview data from the position I establish by drawing on other disciplines, teasing out the connections that designers have with the tangible qualities of the printed book and showing the ways these are, and are not, affected by digital processes. More specifically, I examine my data with the following questions in mind. First, how much do designers use physical materials and non-digital tools in their design process, and are there any apparent disadvantages in the switch to digital ones? Second, what do designers think they have learned from pre-digital processes and engagement with tangible materials? Third, how much attention is placed on the ‘materials side of things’ in terms of the sensory and emotional resonance associated with a printed book, and has the digital environment separated designers from keeping these attributes in mind? Finally, what degree of control do designers have over the production decisions of a book and has this changed with the switch to digital technology?

In order to discuss the importance of material properties, I first raise the issue of materiality, and argue that there is a place for considering the notion of immateriality in relation to digital files. This deviates from other debates concerned with the future of the book, which advocate the need to avoid such binary distinctions. While I understand the reasons for this approach, I wish to put forward the idea that metaphorically, if not literally, ‘immaterial’ can communicate a sense of the world that no other term captures sufficiently. Therefore, for the purpose of this thesis, I begin by discussing how the term materiality is understood in our age of intangible, digital objects, and why I see this as a key issue. To this end, I consider the nature of digital bits in the

context of how we experience them, drawing on the positions of selected scholars from the study of Material Culture and other related disciplines.

### **8.1. The problem of materiality**

Materiality has become an increasingly recurrent theme in our climate of virtual, intangible objects and environments, and one that frequently appears in discussions relating to the book. The term occurs whether the focus is on preservation, new forms of writing and reading, or future design possibilities. Yet the term is problematic: what ‘material’ signifies to a physicist differs from that of an anthropologist, philosopher, sociologist or an artist. Despite this disparity in usage, they might all agree that a single definition of materiality that suits all disciplines and perspectives is not easily found. Sociologist Filipe Carreira da Silva confirms this difficulty through his description of the ‘muddled and sometimes downright puzzling discussions on materiality’ (2016). Within the field of design, writer and Professor of design Denise Gonzales Crisp adds further confirmation of the problem, pointing out that ‘We live in confusing times as far as materiality is concerned’ (Gonzales Crisp, 2012: 181). Her own solution is to avoid a single definition in favour of a more pluralistic view. From this position, she argues for multiple forms of materialities—a view which is shared with scholars in the field of Digital Humanities. While this makes some sense in the context of the digital environment and new modes of writing, it fails to address the problem fully. Such tendency to sidestep the issue is testimony to the fact that what is often meant by materiality is, ironically, hard to pin down.

The main problem with the notion of materiality lies in the fact that the precise, scientific understanding of the material world is at odds with a more customary usage, where material is synonymous with physical, and where physical implies the attributes of tangibility and an unambiguous sense of presence. In other words, a characteristic view is of a world comprised of objects and materials that can be apprehended. While I recognise that an interpretation of materiality simply as physical artefacts is superficial, even within scholarly circles the term is understood contextually. For example, for a cosmologist, everything is matter or material, while Material Culture schol-

ars put the case for us to ‘understand materiality not so much as physics but as cultural process’ (Buchli, 2002: 18).

As highlighted above, digital technologies have naturally brought to the foreground issues of disembodiment, intangibility and the very nature of things. In turn, this has inevitably led us to think more deeply about the meaning of materiality. If we follow a simple definition of ‘immaterial’ as not existing in a physical form, we are left with a problem. While we can accept that at the nanotechnological level digital bits are made of ‘matter’, in any meaningful sense, digital objects (made of bits) do not perfectly fit the idea of material as they do not ‘exist outside of the act of retrieval’ (Smith, 1998). This makes their presence somewhat equivocal. Therefore, I argue that for any discussion around digital and non-digital objects and our interactions with them, there is a need to make an intelligent and effective distinction between the concrete or tangible, and the abstract or intangible, even if both qualify—at a scientific level—as material. While visibility is clearly not a necessary condition of physicality, a ‘thing’ that has an ambiguous physical presence, or lacks the possibility for sensual engagement, affects our perceptual and cognitive understanding of it, as the previous chapters have shown. As anthropologist Alison Clarke (2011) argues, in the digital age, ‘thingness’ has changed.

This is relevant for book designers, who are in the business of making things which may now take tangible and intangible forms. With digital technologies, design process is predominantly conducted by manipulating electronic bits in order to realise an aesthetic vision. This requires an ability to translate what is seen on screen into a material outcome. Designer Alistair Hall makes a comment in this regard. He states:

[B]ecause we design on screen it is more difficult to – you have to make a translation in your head to something physical to think how it’s going to print, how is it going to over print, how are the colours going to look on a different paper, how that paper is going to move and shake, and even having a library of different stuff as a reference library, to go ‘this helps me understand what this is going to be like’. That’s where, when you are learning design, if

you are doing silk screen printing and etching and linocut – all that stuff is helping you understand the physical nature of things.

To talk usefully about the book and its design in our current era, I propose a need to distinguish between the materiality of objects with a physical presence and those that exist only when made accessible through an electronic device. This is not to diminish the value or place of digital; it is simply to stress that the differences in terms of our sense of materiality are profound, and that we cannot fully understand the consequences of digital tools and media if we avoid this distinction. In the case of a printed book, the material attributes are conspicuous, whereas the materiality of an ebook is only ever implied. David Levy (2011, 156) contests this by arguing that digital bits are every bit as material as calligraphy on vellum. Yet he makes this point on the basis that these bits are ‘embedded in a material substrate’. While this is plausible, it is also flawed. An e-reader is inarguably a material object that provides a substrate for digital text. Yet, while accessing an e-book involves interaction with a physical object, the textual material is not personalised for the product itself and its embedding is anything but fixed, durable or contained. An e-reader, or any device that makes a digital book accessible, is merely a conduit through which ideas flow and as such, the text might be described better as disembodied. Furthermore, when we are reminded of the materiality of the reading device—for example, through a glitch in the software or a fault in the screen—this creates a sense of intrusive noise, which in turn highlights our perceptions of digital forms as something other than material.

By contrast, in a printed form, the text is unambiguously both embedded and embodied. This makes a difference to how we perceive and value what we encounter, and what we invest in. Typographic design clearly contributes to functionality and form with digital texts, but the design considerations are now made against a background of transience and mutability, creating a kind of incongruity. Several of my interviewees indicate that part of their motivation comes from a desire to make something with a relatively permanent, tangible existence. For instance, Dale Tomlinson voices his focus on the presence and longevity of the book: ‘I like the idea of working on academic books, because these books go into libraries, last a long time. On the right materials

and all the rest of it. There is something quite satisfying about doing that.’ Likewise, Alistair Hall states that with print, ‘there is the bit about getting printed stuff back and saying here’s the thing and knowing it will be around for a while.’

In the pursuit of understanding materiality in the context of books and digital processes, the physicality of digital bits needs some explanation. Matthew Kirschenbaum, a literature and digital humanities scholar, has examined materiality in the digital environment in impressive depth and puts forward an interesting way of thinking about materiality with electronic forms. He first explains how digital bits can be measured in microns when recorded on a magnetic disk and then made visible through magnetic force microscopy (Kirschenbaum, 2012). This may be the case literally, yet it obscures the different ways in which we respond to digital and non-digital objects. In other words, that digital data can be made into a physical form of existence through technological transformation is to miss a point. However, Kirschenbaum does recognise that this is not the full extent of the issue, and he goes on to examine the concept of materiality by dividing it into two categories: ‘forensic’ and ‘formal’. The former acknowledges digital bits as matter, as demonstrated through the resonating technology referred to above; their traces are left in the substrates and surfaces of computer storage devices and can be nearly impossible to erase. By using this as proof that each bit has a physicality and is also subject to possible error, Kirschenbaum seeks to contradict the argument that digital textuality is ephemeral and homogenous. At an abstract level this is legitimate, but again, it runs counter to our experience of digital objects as immaculately reproducible, transient and able to resist realistic levels of retrieval.

This brings us to Kirschenbaum’s second category, which he names ‘formal materiality’. Here, he puts forward an alternative definition that does not insist that we understand digital bits as physical, but rather as representational. In this case, bits are recognised as symbols. Electronic media, he explains, involve the manipulation of symbols rather than materials. Seeing digital bits in this way connects with a comment made by book designer Dale Tomlinson. Dale offers an interesting view on his design process in comparison with a traditional view of craft. He sees book design as a craft, but describes it now



as being ‘sort of a digital version of that.’ He explains ‘We always think of crafts people as being hands on, using materials and all the rest of it. I see just manipulating that type on screen – it’s purely about spacing at the end of the day.’ This pinpoints a particular change in the way a designer thinks about and imagines type, which in digital form loses specificity and is instead considered as infinitely malleable and unfixed. Dale’s idea resonates with Kirschenbaum’s own concept of formal materiality, which he summarises as ‘... a way of articulating a relative or just-in time dimension of materiality, one where any material particulars are arbitrary and independent of the underlying computational environment...’ (Kirschenbaum, 2012: 13). Following this description, digital objects can be understood as having only fleeting or momentary material existence, and where the materiality is beyond sensory and even cognitive reach. This lightness of material, so to speak, has implications for the design process.

As I have argued in the previous chapters, concrete existence and a connection with materials is part of a designer’s relationship with what is being designed. Alistair Hall reflects on why he likes to design for print:

I think it’s that idea of having something tangible when it’s finished. That you have an identifiable product, I can hand it to you and now you’ve got it. And know I can interact with it, and it’s not going to change. That thing is going to be there and its going to stay the same and I guess on a very basic level you’re leaving your mark on the world with the physical object, compared with the digital stuff, which feels ephemeral because it changes constantly because it has no status.

Alistair hints at a sense of absence with digital objects and the degree to which his level of engagement with something is correlated with his desire to possess it in material form. This is not a unique view. Simon Loxley refers to the importance of physical presence in relation to the print journal he produces.

[...] I think if it did just exist as an online magazine it would take away the point of it, and if it has any power at all, it would lose

that power. I think if you do have a copy and give it to somebody you get a great response from that [...]. That thing that people actually hold in their hands. It's quite a powerful interaction.

As part of her design process, my youngest participant, Charlotte Tate, imagines the visual and tactual experience of a book she is designing. She starts by thinking about '[...] who is going to be reading it, what they would want this book to look like, why would they buy our version, and how do they want to feel when reading it.' Designer and letterpress printer Phil Treble more directly remarks on the tangible nature of objects and associates this with quality. He is attracted to letterpress printing because of 'the sense of satisfaction at the end, having something tangible, something you can feel in your hand, something of quality'.

The lack of solidity and permanence that is inherent with digital bits has a second implication. Digital design processes reduce commitment and investment—not just in terms of the monetary cost of materials, but in terms of physical effort and advance problem solving by thinking through the whole process in the early stages. David Jury's extensive experience with digital and pre-digital technologies makes him well placed to reflect on differences. Although he is comparing digital process with the labour-intensive letterpress work, he makes a valid point. He explains:

With digital you can work on automatic to a large extent and that's the danger of it. With letterpress you can't work on automatic, or at least [...] for me, and for lots of people that use letterpress [...] those sloppy accidents don't happen with letterpress because there is too much time invested in setting something up so you really do choose something thinking that it's right, and you've already thought long and hard about it. Whereas with digital, there is no investment whatsoever. [...] from an education point of view, and I would say from a creative point of view, that's a damaging situation to be in, where you don't have to invest any time or thought before you switch it on. When I walk into my letterpress studio and I open a drawer, you know you've got hours

of effort – there’s physical effort – literally pulling things off and moving things around, you really do think before you do it. Do I need to do this, or is there another way of doing it? It even comes down to the details, with spaces between characters, you change the width of a space, just having to go to a drawer to find it and to unlock everything, that means you do think very hard about is that the right space, should there even be a comma?

David indicates how the material qualities of the different technologies affect design process by changing the order in which decisions can be made. His point is not only valid in the comparison of letterpress work with digital, it also holds true for the era of phototypesetting. With this system, design was still carefully worked out on paper and written specifications supplied to a typesetter operating a phototypesetting machine. Proofs were then corrected before clean galley proofs on high resolution photographic paper would be cut and pasted to form pages, or artwork. To change a typographic decision after type had been specified and set involved a significant cost, both financially and in lost time. As with letterpress, there was necessarily more investment in getting copy and design right from the beginning. This contrasts with digital work, where changes to copy or even type size, for instance, may be made at the eleventh hour. As Michael Mitchell explains:

There’s been a collapse in the process. Before, any editor who had typeset on a monotype machine and then made huge changes, all hell would break loose! Now in fact the whole business of charging authors with corrections, that’s gone out of the window. No one would dare do that anymore. Yet we have books that go back to the author and come back riddled with corrections.

Susan Wightman continues: ‘But because they don’t have to think about it before we lay it out, I think some people have lost the ability to visualise how it is going to look.’ All of these comments point directly to a significant change that corresponds with digitisation. The practice of forward-thinking, anticipating problems and thorough planning that was part of book-making process, is becoming lost from the early stages of design.

Before I draw further on my interview data for first-hand reflections on changes in design process, I return to the use of the term materiality in the context of book design. If electronic texts can be considered to be as material as printed ones, how do we differentiate between the two? Furthermore, if digital environments create a mere illusory sense of immateriality, is there any place for the term materiality in a discussion involving the book or its design? Designer and researcher Rathna Ramanathan thinks not. In a symposium on the future of publishing, Ramanathan argued for moving beyond the ‘simplistic polarity between print and digital and between the material and the immaterial’ (Ramanathan, 2015). Her point is persuasive. The use of these opposing terms can be misleading, and restrict a progressive approach to the book and new opportunities for design. It is clear that immaterial and intangible are not the same, and there is a danger of using one to imply the other. However, tangibility and materiality are not disconnected; given the complexity of our relationships and interactions with artefacts of all forms, there is surely need to take into account how we experience materiality as physical beings in the digital age. No doubt we are adapting to our digital and virtual environments, but DeNicola (2011, 204) is right when he states that digital suggests a ‘disconnection from material reality’, and this should not be disregarded. Whatever this material reality is, when it comes to discussing books and our engagement with the materials with which they are made, it would help to distinguish between objects that can be touched, held and have a particular presence, from those that cannot be held and have a presence of a different order. Digital objects may share a few of the attributes of physical ones (if it is even possible to make this distinction)—especially when we examine the qualities of digital bits with Kirschenbaum’s forensic eye—but tactility is not one of them. Consequently, digital objects are lacking when it comes to engaging the full range of our senses and, as argued in previous chapters, this matters for how we think and act as designers.

So, where does this leave us when it comes to discussing materiality and physicality? To recap, materiality is understood within the contexts and boundaries of different disciplines and many scholars have come to think in terms of ‘new’ or ‘multiple’ materialities. Digitisation has made intangible objects a norm; it has also led to new forms of networks, creating social con-

nectivity and data production and availability on a global scale. Consequently, these changes have both challenged and expanded how we think of the material world, creating a form of dissonance between what we can logically comprehend and what we more holistically sense. While it is inarguable that digital bits can be shown to be physical, acknowledging that they can exist in such form is only partially helpful. As Kirschenbaum aptly concludes, materiality becomes relative in the digital environment—which leads to the idea that the concept of materiality is in itself unstable. Viewing a page of text on a screen undeniably involves material engagement—the act of looking and perceiving characteristics that are displayed—but the materiality is essentially fluid. While this could be compared to watching water flow in a stream, the notable difference is that water can be touched and its existence haptically verified. It is this difference that has consequences for the ways we sense, think and act. Again, there is a case for finding a way to discuss materiality and material that allows us to account for the sense of difference between something concretely physical, and one that is in effect intangible and unambiguously present. In other words, it is imperative that we articulate materiality in relation to our experience as physical beings, rather than in the abstract. This, to an extent, is in the same spirit as Daniel Miller's argument that a theory of materiality needs to '[...] encompass both colloquial and philosophical uses of this term' (Miller, 2005: 4). For the purpose of this thesis and indeed any issues concerned with tactile engagement with material objects, this needs addressing. I now turn to the study of Material Culture to further the case that in this context, for something to be material, it should satisfy the following conditions: it should have an independent existence rather than being dependent on a process of translation, and it must be capable of creating sensory and emotional resonance. Digital files may not be literally immaterial, and they are not emotionally neutral when made available to be perceived through an existing technological device (which, once obsolete would remove the possibility of accessibility), yet, if judged using these conditions, they are other than material, or have an absence of materiality. I therefore suggest that digital files are 'amaterial', or have the quality of 'amateriality'.

## 8.2. Material Culture

Just as we have seen a turn towards embodiment and sensory perception in the cognitive sciences, there has been a similar turn towards the material, or to ‘things’. This is indicated by the emergence of Material Culture as a distinct area of study. The view of materiality from scholars in this field is useful for understanding better how we can examine our relationships with all kinds of objects, including the printed book and the tools used in the design process. It is also useful for understanding materiality.

In brief, Material Culture is a branch of Anthropology that is specifically interested in the ways we produce (make), trade and consume objects, and the social effects that arise from these activities. Miller (n.d) and his colleagues at University College London (UCL), describe their present work as being ‘engaged with exploring the nature and experience of materiality’. While this explicitly refers to the experiential aspects of materials, it does not offer a definition of materiality. Victor Buchli (2002) describes the field not as a discipline, but as research that intervenes between several disciplines, translating between the physical and the social realms. Whereas Kirschenbaum makes the case for data as matter, scholars in the field of Material Culture essentially enquire into how ‘things’ shape our social and cultural lives. The problem, however, is how we define or understand ‘things’. To refer back to Clarke (2011: 9), since digitisation, ‘Thingness is simply not what it used to be.’

A further definition of the discipline is offered by Miller, who concludes that ‘the study of material culture is ultimately a study of value and of values’. (Miller, 2008: 296.) Yet human values, like thoughts, are in a certain sense immaterial. Our values, though, can be made evident partly through our relationships with physical objects, as Miller demonstrates in his study of people and their possessions. Miller’s understanding is pertinent for any discussion of printed books: as significant cultural artefacts, books reveal both individual and collective value, gained from content, design and physical presence. As designer Simon Loxley comments ‘you know you’ve become [a book lover] the day you buy a book with the complete certainty that you will never read it – it is what it represents as an object.’ What it represents for a book designer is likely to be consciously associated with the qualities of design. However,

those qualities also contribute, if less consciously, to the value that a book holds for any owner or prospective buyer. The material qualities, enhanced through good design, matter not simply for the reading process, but to the short and long-term value of the object itself.

As a distinct field, Material Culture is relatively young, but anthropologists and archaeologists have long been studying material artefacts and their cultural roles in shaping past and present societies. Yet, the degree of attention given to the surface properties of artefacts is an area that archaeologist Nicole Boivin questions. She argues that her discipline—like Material Culture—has disproportionately focused on the symbolic nature of objects and their meaning, with the consequence of sidelining the potency of their particular material attributes. In reflecting on her own research, she explains how she came to see the impact of the material world on the social, not simply because it carries ideas and concepts, but because ‘its very materiality exerts a force that in human hands becomes a social force’ (Boivin, 2008: 6). Here, she is identifying the need for more specific examination of the affordances of physical (tangible) materials and how these have impacts on social behaviour and even human development. She argues that it is ‘the actual physical properties of things – rather than the ideas we hold about them [that] instigate change, by placing constraints on some activities and behaviours, and making possible, encouraging or demanding other types of behaviour’ (2008: 166). For her, Material Culture scholars under-emphasise the material and she presses us to attend more to the materiality of materials (Boivin, 2008). While this brings us back to the ambiguity around the word ‘materiality’, it points back to the theory of affordance covered in chapter five in the way it alludes to what surface properties offer, and supports the need to confront how we think about material presence in the context of books and their making. Foregrounding material properties again draws out the different nature of digital files and, in so doing, leads to the notion of resonance.

### **Presence, absence and resonance**

Boivin (2008: 8/9) argues that the material world ‘evoke[s] experiences that lie beyond the verbal, beyond the conceptual, and beyond even the conscious.’ They are ‘part of the realm of the sensual, of experience, and of emotion,



rather than a world of concepts, codes and meaning.’ This is not at odds with Miller’s work on our relationships with things, but her emphasis is more fully on the sensory aspects of physical materials and the emotional charge they can carry. We have no difficulty in seeing how this is the case with printed books and, by extension, their design. In printed form, a book is more than an object for the purpose of transmitting knowledge. It has both functional and symbolic values that are influenced by the design decisions concerning all material attributes. How a book feels in the hand, how the pages turn, the typographic details and the ease of recollection are essential elements of a book’s functional and cultural value. Books remind us not just of information, but of who we are. The books on our bookshelves tell ourselves and others of our knowledge, our preferences and our values. They also store memories. But these functions cannot be met without evident physical presence. Through her work on book preservation and digital conversion, librarian Catherine Eagleton (2015) acknowledged that digital forms have yet to find equivalent ways of inhabiting our lives. Physical books provide us with a quality that could be described as resonance, or as Boivin suggests, an ‘emotional resonance’ (2008: 111). This helps shape our understanding of the difference between material and non-material forms. As argued above, digital objects may be undeniably physical in a precise sense, yet they lack the degree of resonance that comes from ‘the multi-sensory nature of the material world’ (Godsen, 2004, cited in Boivin, 2008: 113). Not only are digital objects lacking in tactile qualities and therefore unable to satisfy our sense of touch, their very nature provides an aura of insubstantiality, impermanence and instability. Taking these attributes together, digital files can be argued to lack materiality as it is usefully comprehended.

### **8.3. The book as a physical object and design process**

To restate, this thesis investigates changes to book-design process brought about by digital technologies, taking into account the impacts on publishing, on the book itself and on the methods of its design and production. Central to the investigation is engagement with materials and physical objects. The theories of technological mediation, situated cognition, affordance and haptic perception have been drawn on to bring different perspectives to bear on what



is at heart an issue of difference between tangible materials and intangible digital bits, and I have argued that digital files lack materiality. Engagement with materials is fundamental for design process generally, as design educators Inna Alesina and Ellen Lupton (2010: 4) confirm with their statement that ‘understanding materials is essential to design’. Materials, in this case, refer specifically to physical forms and the objects which can be made from them. Just as Material Culture scholars remind us that it is a mistake to separate the meaning of an object from its material properties, book historians such as McKenzie (2002) assert that it is a mistake to separate the meaning of a text from the material aspects of the book. For book design, then, the physical properties of a book are crucial—not simply for aesthetics and functionality, but also for symbolic values, and these should underpin process and practice.

Most of the designers I interviewed show awareness of the meaning that a book can carry and indicate a wish for their designs to create a form of attachment. For instance, Simon Loxley talks of his desire to achieve an emotional response:

But you think then of what you’re doing and hope that someone will feel that way about it, even in the future, and it sort of means something to them and also has some association, if it is the actual book itself that has meaning for them.... And what you’ve designed becomes part of the mystique around it. That design, that edition, and if that person sees it.

Alistair Hall shows his awareness of the symbolic value of printed material in comparison with digital counterparts. He uses the example of an invitation and explains that a physical version communicates more than the details of an event. He reflects:

I can send you a Facebook invitation and it’s quick and good, but if I send you a printed thing it suggests something about the event, it suggests I’m spending a bit of money on it maybe, and it says that I’m focusing on it, it’s an important thing, not something I’m just dashing off.

His description pinpoints a distinct change. In the light of digital objects, the physicality of materials takes on a particular significance. Through intentional choice, materials become a means of communication in themselves.

Acclaimed designer Peter Guy (1938–2009) shared his view that some designers, particularly those trained in graphic design, ‘think of books as being a succession of flat images when a book is open, when, in fact, it is a three dimensional, tactile thing – not flat’ (Bastin, 1977). It is easy to see how this view of the book is augmented by the digital process, which for most designers now involves working almost exclusively on a computer screen. Guy’s concern is valid, but the designers I interviewed show the extent to which they keep the book as a physical, three-dimensional object in mind. My most experienced book designer, Geoff Green, is acutely aware of the book as an object and all its sensory qualities. He states ‘People do like tactile things [...] The ink, the glue of the binding – all of these things are part of the book experience.’

Simon Loxley’s strong sense of the three-dimensional nature of a book comes across in his comments too. He explains that in the process of designing a book, he thinks about ‘... what kind of space it might occupy on a shelf. What presence it might have...’.

Charlotte Tate is lucky to work for a publishing house which places priority on the material qualities of their books, because its publications are intended to offer a customer more than content. She explains, ‘[...] we don’t do new editions, we do better versions of old editions. We give them the most luxurious feel, so we take the time to design every single book individually and also the paper we use, the binding, that’s what makes our books a bit more special than usual trade books.’ Although she doesn’t have control over the binding, she pays attention to these decisions in order to create a unified, three-dimensional object. She says:

[...] I work closely with the binding designers so we can make sure that a typeface that is used on the binding is also reflected on the display text. Just so that when people are reading the book it

looks like there is joined up thinking. We don't want stuff to look like it has been designed by two separate people, we want it to look like it has been designed and considered as a whole.

David Jury offers an insightful comparison between his digital and traditional processes in relation to imagining the book as a physical object. In response to my questions about his first thoughts for the design of a book, and how he considers the page in relation to its whole form, David first asks for clarification: 'Are we talking about a digital book or a letterpress book?' When I ask if there is a difference, he offers the following account:

Yes there is. With a letterpress book you are thinking about the whole book all the time. Because when you make those decisions about the paper for instance, you are immediately thinking about the weight of the book and the weight of the paper. And you turn the page – you need to know the paper will behave in a certain way. If it's a horizontal book for instance, the paper needs to be heavier because you've got a lot more ... with a larger book ... if the paper is too light it doesn't behave in the right way when you lift it. With a digital book for the reasons I've explained, those choices are taken away. With letterpress you can do any size book, you are much more aware of those physical attributes. And because you've got to think about the turning of the page, you then start thinking about the binding and how that's going to work. You think about the cover ... with a letterpress book you are aware that it is a physical object. But with digital I'm aware that I think much more about the inside and the outside comes later. I'm not involved with the designing of the weight of the boards, or again we will talk about it, the binding and boards aren't mind decision. So I am thinking much more about the architecture of the page layouts. It's a big negative.

Boivin's arguments that physical materials have resonance is reflected in the way my designers talk about the printed book and the qualities of the materials used to create them. As mentioned above, when Simon Loxley designs a

book he thinks about ‘... what kind of space it might occupy on a shelf. What presence it might have...’. David Jury sees resonance occurring in objects that have traces of the hand of the maker. He wonders if with digital, this is ‘what’s missing – that tends to be all we’ve lost. And people would argue that we’d lost that with mechanised printing anyway, but digital just seems to have taken that to another level.’ Susan Wightman notices that many of her customers are particularly interested in the materials of the book. She comments that ‘Most people who turn up here wanting us to do a book, the first thing they want to talk about is the endpapers! People get very excited about endpapers.’ Whether excitement, delight, satisfaction, or even disappointment, there is often an emotional response to material properties of a book. Yet designers are more often than not distanced from this level of decision-making, even though it is clearly a vital part of book design.

### **Control over the book materials**

There appears to be disadvantages associated with a lack of involvement with the physical materials used to make a book, as David Jury points out in his companions of processes above. Historically, designers have had limited degrees of control over the production decisions, so this is not particularly new. However, in pre-digital times, the material choices would certainly influence design. Geoff Green remembers how it was necessary to take into account the kind of paper that a book was to be printed on because with physical type, the materials and their particular attributes directly influenced design decisions. As he recalls: ‘When you designed a book at that time if you chose Bembo for the text face, you would then have to carefully ask, or think about what paper it was being printed on. ... if you were using Bembo you didn’t use an art paper and if you were using a laid paper, you didn’t use something heavy.’ The connection between the typographic design and the materials of production could not be ignored, keeping the book as a whole clearly in mind.

While it is unusual for a book designer to be involved in decisions involving format, dimensions, paper quality, printing, binding and so on, these are the very things that my designers recognise are important for the design of a book. They are also explicitly included in traditional book-design definitions, as discussed in chapter two. My designers show that they enjoy input in these

elements, but are rarely included in these decisions. David Pearson reflects on the different degrees of control over the material qualities of books he has designed. He explains:

Some books, for example *Penguin by Design*, which was the book that was my idea to do, everything was up for grabs. So that was great, you were able to pick a vessel that was perfectly suited to the content. That's when it is at it's best – when you have a hand in all those things including paper and the like. It doesn't always happen. [...] If you work for a smaller publisher you'll generally have a bigger say. I'm working for a smaller publisher now where they are involving me in all of those things to a major extent.'

Geoff Green is unusual in that a good proportion of his work involves advising on and selecting materials, and he has sufficient knowledge and experience of their nature to make good judgements. David Jury has gained a similar level of experience through working with letterpress—a physical process that is entirely bound up with materials. He describes this connection in detail:

With letterpress you are very aware of the link between the physical type that needs to have just amount the right amount of ink, and how that inks looks and behaves when applied to the paper. And that process makes you very aware of the physical aspects of the surface of the paper. Its weight and its almost dryness [...] – a crispness to it – certain aspects of its surface which you know are going to affect the way the ink and the type look when it is printed on the paper. So of course you are aware of the tactile aspects of those materials. With digital of course you are never aware of that.

Dale Tomlinson is another book designer who places great emphasis on the materials of a book, and frequently mentions aspects such as paper grain and the attributes of different methods of binding. In his view, the whole process

could be improved with more communication between all the agents involved. With his freelance work, he often gets total control over all the elements that make up a physical book, but describes the in-house experience differently:

[...] if you are in a publishing house that is taking that away from you – you have production managers, production assistants, design assistants – a whole raft of people that can take away all that stuff. It means you can focus on good quality design, but it means you may not really engage with the materials too much – and sort of not care about it.

He gives an example of a recent experience, showing how one decision has an impact on another:

It's in the early stages [...] I got the design internal pages done. We started to look at the outside, how it's going to work. Materials, this kind of elastic band to wrap round pages, part of the binding. Then we are into the binding, whether it is blocking, printed paper case and so on. So the design job quickly moved towards the materials side of it. As the designer, I've got these things going through my head, the publisher is going maybe we could try this or that. They don't see how the design impacts on the materials, [...] So you try to pull them back to a design idea which should be compatible with the materials because that is part of the design.

Dale points out how the typographic design and the other material considerations of a book are, and should be, carefully interwoven—an aspect of book design that can become lost in the publishing process. Although my interviewees are generally excluded from many decisions about the elements that make up a printed book, some have managed to maintain a connection through aspects of their work. With Phil Treble and David Jury, this is through their own letterpress practice; with Dale, it is through work with independent publishers who value his holistic vision and knowledge; with David Pearson it is similarly through work with small publishers and through his own publishing

activity. Charlotte Tate she keeps informed about the non-typographic elements of a book through her liaison with the binding department in her place of work, in order to make a book that looks like it ‘has been designed and considered as a whole.’

David Jury is well aware of the difference in his design process when he is commissioned by a publisher. He recounts:

I’ll be suggesting the paper and will have those discussions, but I know at the end of the day the publisher will decide on the paper and it is often the publisher that decides on the size of the book. Because they’ll say the concept of this book is that it’s ‘the little book of something’, so it has to ... it doesn’t matter what you say you’re not going to change their minds. So those choices are taken away from you. You tend not to invest your time in those kind of decisions.

This contrasts with his independent work, where he will always ‘be thinking of the nature of the material’.

Although a designer may have no part in decisions over the materials used for a book, nonetheless, being informed of the choice is important for design. Susan Wightman at Libanus Press indicates how she takes into account the qualities of paper in her designs. She mentions ‘Something that does kind of crop up, is things like whether the stock is going to be coated, a very white stock – do we then think about ways of toning that down with the text pages? So we do think about the physical object.’ Her business partner, Michael Mitchell, elaborates: ‘Yes we do. And the binding method is very important in terms of gutter margins and things like that. And sometimes it is very difficult to bully out of a publisher what they intend to do. Simultaneous hardback and paperback, or just paperback, whether it’s going to go down to B, or even A.’ Without knowledge of these aspects, successful design is compromised, as Michael indicates. He expresses his frustration with the situation, referring to a particularly disappointing example:

The designer is the designer that controls the final product but it seems to me that they're not most of the time. Whether it's printed in China or not, whether we seek digital proofs or not, whether we have any say on the paper or not. The book we are talking about was printed on completely unsuitable stock, so the designer can feel frustrated at that point because they lost any sense of direction over the finished product.

Similarly, David Pearson believes it makes sense for the designer to be in control of these aspects. He states:

[...] with a book where the designer has done insides and outsides, and they've judged [pause ...] They are always thinking about the book to the extent that they are imagining how thick the paper should be, how quick the page should turn – in that respect it feels so logical for the designer to have a heavy hand in that. Just putting things on the page – show through of those things on a page – that's a design issue, the designer should be a key part of that if they are designing a book. You need to be plugged into those decisions. Yeah, it's all about how involved the designer is on design decisions of the whole book. My business is mainly covers and now I expect to have much less say in the production of the complete book. But if I'm designing the whole book I will expect to have a say in absolutely everything, to the point where I'll be liaising with the printers and when the book is printed checking the printing, signing it off. That's the difference.'

### **Material engagement and design know-how**

Even though Geoff Green expresses confidence in his digital process, he explains that there is no substitute for handling a physical book as a way of judging the success of a design. He tells me '... you know you can do a design on a screen, and you send it as pdf proofs, and whatever, but it is only when you see – and feel – the finished item that you can then comprehend if it has worked or not.' Dale Tomlinson is also confident in his judgement of what works and what doesn't and this leads him rarely to engage with physi-



cal materials during his design process; yet he is adamant that you cannot design properly with ignorance of materials. He asserts:

You've really got to look at this and know stuff about how paper works. Grain direction, binding, this all impacts on the object of the book. So you can either see it as a page with a design on it which doesn't relate to anything so you might as well see it on screen, just a printed piece of paper. The moment you make that into a proper object is where you start having to think about decisions beyond your typographic design and the rest of it.

Most of my interviewees showed a similar appreciation of the qualities and effects of book materials, yet in his capacity of teaching design, David Jury is sure that students are not engaging with book materials. David states 'I notice with students these days, there is very little awareness of paper. Its weight, its feel ..... they tend not to make those decisions, because the digital process has become so automated.' The knowledge and understanding of materials shown by Dale and most of my other designers is perhaps one of the costs of the switch to digital processes. David sums up the need for material engagement with book design in his comment that 'Two things are really important with books. That you are turning sheets of paper, you get the weight of the paper, so you get a sense of what you see as you turn the sheets of paper.' (It was striking that at this point in the interview, David simulated, or gestured the act of turning pages with his body as he spoke, as though he was experiencing the haptic sensations.) In having physical contact with the material a designer is acutely aware of the object's physical characteristics—from its texture and weight, to how it looks from different perspectives. Therefore, in the act of handling something, we can appreciate and judge its general and specific behaviour. The way a book handles is not separate from how it looks, and neither how it feels or looks is separate from how it is read.

David has more to contribute. He sheds additional light on what we attend to when we have direct contact with materials. Drawing on his letterpress experience, he points out that 'It even comes down to the details. With spaces between characters, you change the width of a space – just having to go to a

drawer to find it and to unlock everything, that means you do think very hard about is that the right space? Should there even be a comma?’ Digital technology makes later changes much less effortful or financially costly, leading to a tendency to be less thoughtful at early stages. Geoff recounts an anecdote of Stanley Morison’s exacting standards during his time at Cambridge University Press. Morison would instruct a compositor to add a hairline space on a printed proof many times over, until he was happy. As Geoff concludes ‘Now of course, the infinitesimal spaces – you can do all on screen.’ While these minute adjustments are easy, he admits that he doesn’t go to such lengths. This is partly because expertly created digital type reduces the need for such close attention, but that may lead to complacency, or make us forget to even contemplate such level of scrutiny.

### **Materials, objects and value**

Returning to the symbolic value of material objects, my participants indicate how they associate physical materials and physical processes with a perception of higher quality and value. Phil is attracted to letterpress because he thinks ‘There are aspects of quality associated with it’, and he assigns this to its physicality: ‘the sense of satisfaction at the end, having something tangible, something you can feel in your hand and something of quality’. However, he acknowledges that this is also attributable to good design, which goes hand-in-hand with appropriate materials. He notes: ‘there will always be people there that appreciate a nice book. Not just hand print or just letterpress printed, but nicely made books that have [had] thought applied to how it is designed, not only in the text design but in the materials that it is made from.’ It is not uncommon for thoughtful typographic design to be accompanied by less thoughtful consideration over the materials and processes of production. Michael Mitchell has examples of such instances, and says ‘Well, we design it and then it goes off to some printer who prints it on a grossly unsuitable paper.’ The choice of stock may not only be inappropriate for the book typography in terms of weight, colour or texture, these features may also be inappropriate for the way the book performs.

Alistair also attributes value to the sensory nature of materials, admitting that even though he enjoys the digital process, he ‘would still value a sheet of

letter-pressed text over a piece run out from a – even a very good – printer because it’s got that tactile nature.’ Alongside this, he maintains a more pragmatic assessment of the value attached to printed objects and what they represent symbolically. As mentioned earlier, he recognises that sending a printed invitation rather than a digital one ‘suggests something about the event, it suggests I’m spending a bit of money on it [... and that] its an important thing.’ Materials carry particular messages beyond their sensory attributes; as Alistair notes, there is the possibility of ‘intentionally using the physicality of it as a means of communicating.’ This is similar to Ellen Lupton’s description of materials as adding to a designers’ vocabulary (Alesina and Lupton, 2010), but it is worth emphasising that messages provided by materials become more pronounced by the contrast with digital alternatives.

#### **8.4. Concluding points**

Materiality is a slippery term and one that is often put aside in discussions of the book and its future prospects. Yet, it underpins the different ways we engage with and react to physical and digital objects. In order to establish what materiality means in the context of this thesis, I have argued that digital files can be considered to be other than material because they do not satisfy two essential conditions. The first is that they do not exist independently; the second is that they lack the emotional charge offered by physical objects. I suggest the term ‘amaterial’ may be a useful way of describing digital objects.

Book design that takes into account all the material aspects of a book leads to a physical and cultural object that has value and resonance, not just for its ability to transmit and preserve knowledge, but as a material artefact with personal meaning and significance, and the ability to generate emotional response. Therefore, there is good reason for designers to maintain or pursue a familiarisation with materials and non-digital processes that engage them directly through physical (manual) contact. The benefits of this have unfolded over the course of the thesis, but it is this chapter that specifically examines what constitutes materials and why this is worthy of further exploration.



## Thesis conclusions

*The hand, the mind and the book* is the outcome of research into the ways digital technologies have altered the process of book design through their effects on the ways we think, perceive and act. I began the study from the premise that the tools we use in the activity of design are more than simply a means to an end, and that digital technologies mediate (i.e. shape human existence and our relationships with the world) in ways that affect designers' thinking more inconspicuously than is currently understood. I argued that book design matters for the future of the book more than is generally evident in debates and research around the subject, and that research into changes in its process is necessary for adding to knowledge and for how design evolves. In the course of the research, I showed that the process of designing a book is affected by designers' own engagement with materials and physical means, and in what ways. Importantly, my main conclusion is that change has occurred in the relationships between the hand, the mind and external objects in the design process. This has implications for the material qualities of books in the future, but the findings may also contribute to research in other fields.

Being guided by both my professional experience and my personal interests, I started my investigation where others in the design field appeared to have stopped. I determined that to pursue the effects of digital technologies on book-design process, I needed to go outside design theory to examine the relationships between thinking (and mental visualisation), and our sensory engagement with material (or physical) objects. I was also instinctively drawn to the concept of materiality, questioning how the term could be usefully applied to contemporary problems concerning digital objects. Therefore, in investigating the thesis question, I held a set of secondary questions (or curiosities) in mind which guided my literature review. In summary, these questions focused my attention on the following: the effects of the switch from working with pencil and paper to working exclusively with digital media; how we define technology and understand its effects from philosophical perspectives; how our actions and perceptions are prompted by the physical

qualities of objects (natural and manmade); the importance of our sense of touch, tactile qualities and manual engagement for cognition, and finally, our grasp of the terms materiality and material in relation to our digital world. These are the issues that I examined in each of the chapters, and are the threads that run and intertwine throughout the thesis. Having immersed myself in theories largely—but not exclusively—from the cognitive sciences, and using these as a basis for analysing the reflections of book designers on their past and present processes, I have come to the conclusions I summarise below. These findings may usefully inform designers, as they point to the potential value of a hybrid practice (integrating traditional and digital processes), but may also be of interest to the publishing industry as it continues to grapple with the relationships between the analogue and the digital, and how one informs the other. They also find justification for specialist book designers with knowledge and experience of the materials of production to play an important role in the future publishing industry.

The study also points to areas for further research into, for example, visual imagination. In the course of the study, I began to question our ability to recall tactile sensations, i.e. if, or how, we can store information about how things feel. I discovered that this has not been researched and could not be tackled within the limits of my own investigation; however, I suggest this is an area of study that could produce important results for many fields of research.

My reading began with the philosophy of technology, which formed my general understanding of what technology is and can be, and introduced me to different theories concerned with how they shape us through our interactions. This underpinned my thinking throughout my research, but through my review of the extensive literature in this field, I developed other ideas. These steered me towards literature in other disciplines, which proved to be of more direct use. These included philosophy of mind (especially embodied cognition) and behavioural psychology, and extended into the studies of the senses and material culture.

The purpose of assimilating the theories circulating in these fields was to provide a viewpoint from which I could analyse the accounts of practising designers, in order to pinpoint relevant changes. I gathered these accounts

through in-depth interviews with a small number of design practitioners chosen for their experience of designing books, and also for their experiences of working with digital and pre-digital technologies. I chose participants that had some commonality (i.e., book typography), but could also provide a degree of heterogeneity in terms of age and experience. In keeping with my qualitative research methodology, I limited the number of participants to 12, which allowed me to conduct extensive conversations that generated rich material. By creating thematic categories to analyse the data, I was able to make comparisons and draw out points of interest in relation to the theories I had covered.

In the first section of the thesis I provided an overview of the publishing industry and looked at recent theories on the current publishing system. I supported the argument that the model of the industry as a machine for content, which rejects the idea of containment, underestimates the value provided by physical, tangible qualities and thereby sidelines the contributions that book designers make. Such publishing models—which foresee a future where editors and designers are superseded by coders and software developers—encourage the tendency to view book design as a part of the publishing system that can be reduced to rules and therefore easily automated. This is already being seen with the uptake of automated software such as *typefi*®. No matter what model of publishing we draw on, the fact remains that the financial viability of publishing comes from the value it adds to content, and this surely includes its value as a material object. I made the case that successful design adds to such material value and referred to the Penguin Great Ideas series as an example of how the volume of sales is significantly linked to holistic book design, from the overall concept, to the text typography and methods of production. Design is the part of the system that converts one form into another, and, for this reason, design and design process should be more prominent in debates about the future of the book.

At the end of this section I looked at studies that have been carried out in the field of design to ascertain what is known about design conceptualisation in relation to change in the use of technologies. One study conducted by Rachel Hewson was particularly informative; by being directly concerned with typographic design for documents, her findings were most closely applicable to

the practice of book design. Hewson's research informed my way of thinking and by drawing on her characteristics and functions of traditional sketching, I identified aspects of these processes that remain beneficial for current design process. These benefits include the exploration of initial ideas, the ease of making comparisons of designs (from different viewpoints), the option to switch fluidly between graphic and non-graphic languages, and the encouragement to simulate experience directly through manipulating physical materials. From this perspective, my data analysis indicates that, to a degree, book designers are aware of some of these advantages and still turn to traditional media intuitively in certain, specific circumstances. However, this tendency is diminishing as designers become more habituated to an exclusively digital process. While 'digital sketching' is not a perfect substitute for its paper counterpart, designers enjoy the speed and precision that their digital tools offer. With the pressures of time and costs, it is hard to opt for what they perceive is a slower, less efficient process, even if—as they largely acknowledge—there are valid reasons to do so. This supports the idea that hybrid practices for all designers can add to their design process by widening skill sets and perspectives, which have implications for the ways we think.

In the second section of the thesis (chapters four to eight) I took a more philosophical approach to my research question. I began by looking at our relationships with technology and developed an argument that what makes something technological is a problem in itself. It became clear to me that technology as a class of objects should be partly defined its long-term effects—not just on certain thoughts and behaviours, but on ways in which our brains physically function. This is the realm of neuroscience and could not be followed further in this thesis, but it is an important factor to appreciate and further study in this field is likely to add more to what we understand about design process in the future. However, by considering the work of a range of philosophers, I made it clear that objects and technologies affect our thoughts and actions and, as Verbeek (2005: 126) succinctly states, that 'Artifacts transform experience.' Importantly, my overview of technological philosophy led me to the conclusion that to understand the possible effects of our interactions with different technologies, we cannot put aside the physical, or material qualities of the objects themselves. This is a position held by post-phenomenologists, and is one that underpinned the rest of the work.



With this viewpoint and a specific focus on physical attributes, I turned towards the field of psychology by looking at Gibson's theory of affordance and recent developments that have stemmed from his first concept. I used these to identify the ways in which the surface and other properties of digital technology encourage designers to act in certain ways, in comparison with the technologies they have replaced. From the perspectives provided by affordance theories, I concluded that the concept is a useful way for designers to expand their thinking about the book itself, placing more specific emphasis on its physical qualities—not simply for aesthetic reasons but in terms of what actions these can invite. This is a key suggestion for approaches to book design. In terms of current design process, my interview data indicated that design software presents a number of possibilities for action in comparison with pre-digital tools, such as easier ways to make patterns with type and the option to postpone advanced thinking or planning. My interviewees seemed to appreciate that the near-infinite malleability of digital objects and the lack of physicality offer an ability to experiment without restrictions, yet they also acknowledged that the lack of constraints had its own limitations, or rather the constraints imposed by older technologies have creative advantages. Based on the concept of affordance I also considered how the physical properties of computer hardware impose limitations, for example through the fixed dimensions of a screen, but most of my participants had not considered this. Several points from this chapter added to the overall thesis picture, but the most significant is as follows: while we can see that the digital environment reduces physical effort and saves time through the possibility to reverse any action easily, it appears to have the side-effect of reducing the need for careful planning and for anticipating problems in advance. This led me to postulate that working on screen reduces the extent to which we exercise prior mental visualisation. As the remainder of this closing chapter will support, this picture became more distinct and persuasive as the research progressed, and became the most significant finding.

Following the work on theories of affordance, I outlined relevant research on embodied, embedded, enactive, and extended cognition (4E) to understand current thinking on the relationships between mind, body and external world. By drawing on the notion that cognition is a process (or system) that is inseparable from bodily movement and even objects in the environment, I con-

sidered the reflections of my participants and found further indications that the switch from conventional tools to digital ones has led to discernible shifts in design process. Although, as Lundborg (2003: 4–7) states, the brain can be regarded as ‘an extension of the hand into our mind exploring and revealing the secrets of the surrounding world’, I noticed a change in the balance between the extent to which designers think through concepts in their heads prior to action, and the kind of design thinking that takes place through engagement with available, external tools. This strengthened the idea that was forming: it looked increasingly as though experience with pre-digital technologies encouraged designers—or gave them a greater capacity—to visualise mentally prior to engagement with any external objects. Working with digital tools from the first stages created a greater tendency to conceive concepts by using the affordances of the software to experiment, or as one participant offered, to ‘try stuff out and think wow, that’s doing something interesting’. However, another participant stressed that the kind of accidental discovery that happens in his letterpress studio is less likely to occur when he is working on screen. I argue that this is not entirely contradictory; working with physical media is less predictable or programmable, no matter how much a designer has thought through an idea. Based on the reflections of my participants, I concluded that to an extent, with less experience of pre-digital technologies, the screen tends to take on the role of rough sketching, even though that rough stage appears much more polished than a pencil and paper version at the same stage of design. For designers with a long background in working conventionally, the screen is more used for working up a design that is already somewhat mentally pictured, or ‘roughly sketched’. Again, this revealed a difference in the degree of prior visualisation that takes place.

This point is connected to a further one. On the one hand, applying the theories of 4E cognition, digital technology can be seen to extend our cognitive process by distributing our thinking more to the environment. On the other, I was beginning to see that working exclusively with digital technology reduces a particular kind of imaginative effort—one that draws on memory and knowledge acquired through experience of material processes and what we might describe as ‘thinking in our heads’. Although I saw the link between direct manual engagement with physical objects and cognitive process, my research suggested that the more an external object could take over, the more the bal-

ance between mind, hand and technology shifted. This is key for understanding the effects of working with digital technology in many areas.

Having understood that our sensory system is inseparable from our cognitive processing, my next step was to focus specifically on manual skills and haptic perception. This was linked to my initial guiding question concerning the importance of touch and tactile qualities for design process. My intention here was to see if the switch to digital tools and media had affected design process through changes in the levels of tactual engagement and handwork. One participant believed that digital tools had degraded both her manual dexterity and attention; others described their drawing skills as being limited to begin with, saying that digital technology allowed them to explore ideas through more sophisticated renditions. In these cases, design software seems to be enabling by giving a greater sense of confidence through the finesse of initial 'sketches'. It is unclear how comparable this is to a quick capturing of ideas on paper in the way the Hewson describes.

However, it does appear that the physical drawing process creates a connection between the mental and manual more acutely than we experience with design software and digital bits, which involve a spatial and tactual interruption in the relationship between hand, eye and mind. While it is possible to draw on paper with our eyes closed using our haptic senses to guide a pencil and imagine our marks, this would be much harder to perform with digital tools, which provide limited tactile feedback. Again, I suggest that using pencil and paper methods may provide a more equal partnership between thought, perception and action than working with an input device and a screen, which my participants indicate encourages more off-loading. Any disadvantages of this (either for the book, or for neurological change), might become evident in the future, but it suggests some advantages in pursuing more hybridised working methods.

For my participants, the practice of printing physical copies for assessing work is diminishing, as they have become habituated to viewing their work purely on screen. In spite of this, most saw a benefit to printing work out, either to look at it from different distances and positions, or to handle it in the way that they would handle a printed book. The turning of pages, seeing how they

appear in sequence in this way adds to what they perceive in terms of both visual and tactile sensations, yet the tendency is to take shortcuts and rely on what they see on the flat, back-lit surface of the screen. As one participant stressed, this alters and reduces important ‘contemplation time’.

Although well-regarded book designer Peter Guy (Bastin, 1977) expressed a concern that designers see a book only as a ‘succession of flat images’, my participants indicated that they remain conscious of the book as a three-dimensional object, and are aware of the importance of the material, sensory qualities. At the same time, they are often only responsible for the typography and are uninvolved in other material decisions. Given that the visual and tactile elements of a book are necessarily intertwined, I argued that this separation is detrimental. I contended that in the digital age, the activity of book design should not be distanced from the material aspects of a book, in order to create a cultural object that has value that extends beyond its ability to transmit and preserve knowledge, and includes the power to generate emotional attachment through its presence and sensory qualities. It follows that there is good reason for designers to maintain or pursue a familiarisation with physical materials and non-digital processes that engage them directly and multi-sensorially. Without this, design process is changed in ways that are likely to off-load more design to design software and to lead the publishing industry increasingly towards being a ‘machine for content’ (Bhaskar, 2013). I concluded that specialist designers, with more responsibility for all physical attributes of the book as a three-dimensional object, could significantly determine the book’s future, as it is the physical attributes that separate the printed form from its digital counterpart. The values of these qualities are becoming more evident and deserve investment.

Throughout the thesis the emphasis has been on the importance of materials and material qualities. Digital technology has drawn attention to physical properties and the concept of materiality itself, through the creation of virtual environments and intangible objects. This is central to any discussion of the book, as electronic forms have undoubtedly highlighted the benefits of tactile attributes and concrete existence. I therefore brought the thesis to a close by focusing on the concept of materiality and how this might be viewed in rela-

tion to the research topic. I argued that there is a place for considering digital files as other than material on the grounds that they do not exist independently and that they lack the emotional charge offered by physical objects, which have a different form of presence. I presented the idea of using the term ‘amateriality’ as a way of describing the difference, offering an alternative perspective on the topic.

In summary, by looking at design process by drawing on other disciplines I have exposed several ways in which the digital age has affected book design. One of these particularly stands out and presents a distinct contribution to the field. The research has revealed that digital technologies may be altering the intricate balance between mind, hand and environment, encouraging us to use the world outside more for our thinking and reducing our mental depiction of visual ideas or anticipation of problems. In other words, digital technologies and their affordances have shifted our cognitive process more towards being ‘situated’ or ‘extended’. The reflections of my interviewees suggest that prior to screen technology there was more emphasis on mental visualisation and thinking a project through prior to acting. External objects were certainly used to extend and enhance that thinking process (for example, the use of paper and pencil sketches and flat plans) and in this way the two were co-dependent. Thoughts occurred on paper in conjunction with manual action—with our hands and brains being directly connected through neural pathways. With digital technology, which allows us to distribute more of the work to computer hardware and software, we are encouraged to imagine less clearly and specifically. As David Jury explained: ‘With letterpress you think first, you have to think first.’ This is less of a necessity in the digital environment.

While new technologies have always repositioned older ones, we are seeing a surprising twist. Pre-digital objects and technologies are repositioning their digital counterparts, as interest in the impacts of the digital environment expands. For instance, the advantages of e-books and e-readers are being weighed against the now-apparent advantages of print books, as the differences between the physical and the non-physical forms open up possibilities for both. This clearly has implications for book design, where the difference between print books and e-books is entirely situated in material qualities and

sensory perception. Specialist book designers who understand all attributes of the printed form are more valuable than ever.

Digital technologies offer unquestionable advantages for the publisher in terms of cost and time savings and possibilities for manipulating content—a publisher’s raw material. They also have considerable advantages for the designer in terms of control and the ability to extend our cognitive process, and allow us to execute more technologically complicated tasks with ease. My participants express no doubt about the benefits of digital tools. Yet, as Morozov (2013: 167) asserts ‘... we tend to dismiss the important role that older technologies play once newer, faster, and shinier alternatives are introduced.’ Now that digital technologies have been an integral part of life for many years, we can critically assess any detrimental aspects to working exclusively on screen. Through this investigation, I have found reasons for incorporating traditional methods and technologies into book design process, so as not to limit the ways we think, perceive and act in the making of a book. This is in line with a cultural turn towards the tangible and the concrete, as well as evident consumer preferences for the printed book, and an understanding of the human mind that is intertwined with our physical nature. I put forward a need to investigate further how designers think in their heads and how they perceive through manual engagement, in relation to the way they also think through the screen. The outcomes of this research are not exclusively of use to the design and publishing community, they also have potential value for the wider fields of human-computer interaction, digital humanities and anyone with interest in the impacts of digitisation on human life.

## References

- Anon., 1999. Gutenberg Prize for Hochuli. [online] Hyphen Press. Available at: [https://hyphenpress.co.uk/journal/news/hochuli\\_gutenberg](https://hyphenpress.co.uk/journal/news/hochuli_gutenberg) [accessed: Feb 2017].
- Alesina, I. and Lupton, L. 2010. *Exploring materials*. New York: Princetown Architectural Press.
- Banham, R., 2009. The industrialisation of the book, 1800-1970. In: S. Eliot and J. Rose, eds. *A companion to the history of the book*. London: Wiley-Blackwell.
- Baron, N. S., 2015. *Words onscreen: the fate of reading in a digital world*. Oxford/New York: Oxford University Press.
- Bartscherer, T. and Coover, R., 2011. *Switching codes*. Chicago, IL: University of Chicago Press.
- Bastin, J., 1977. *A look at British book design today with particular reference to Peter Guy*. Module dissertation: Publishing. Oxford Polytechnic. pp35-47. (See appendix C.)
- Berry, J. D., 2006. *Dot-font: talking about design*. New York: Mark Batty Publisher.
- Berry, J. Typoinstitute.org. (n.d.). About Scripta | Scripta. [online] Available at: <http://typoinstitute.org/info/about-scripta/> [Accessed 10 Oct. 2015].
- Bhaskar, M., 2013. *The content machine*. London/New York: Anthem Press.
- Bilda, Z. and Demirkan, H., 2003. An insight on designers' sketching activities in traditional versus digital media. *Design Studies*, 24(1), January, pp27-50.
- Boivin, M., 2008. *Material cultures, material minds*. Cambridge/New York: Cambridge University Press.
- Borgmann, A., 1984. *Technology and the character of contemporary life*. Chicago/London: University of Chicago Press.
- Borgmann, A., 2000. *Holding on to reality: the nature of information at the turn of the millennium*. Chicago, IL: University of Chicago Press.
- Bostrom, N., 2008. Why I want to be a posthuman when I grow up. [pdf] In: B. Gordijn and R. Chadwick (eds). *Medical enhancement and posthumanity*. New York:Springer, pp. 107-137. Available at: <http://www.nickbostrom.com/posthuman.pdf> [accessed: August 2018].



- Bowker, G. 2008. *Memory practices in the sciences*. Cambridge, MA: MIT Press.
- Brew, A., Fava, M. and Kantrowitz, A., 2012. Drawing connections: new directions in drawing and cognition research. [pdf] In: *The proceedings of the 2012 drawing research network conference*. Loughborough, UK, 10-11 September 2012. Loughborough: Loughborough University. Available at: [https://www.academia.edu/2343238/Brew\\_A.\\_Kantrowitz\\_A.\\_and\\_Fava\\_M.\\_2012\\_Drawing\\_Connections\\_new\\_directions\\_in\\_drawing\\_and\\_cognition\\_research](https://www.academia.edu/2343238/Brew_A._Kantrowitz_A._and_Fava_M._2012_Drawing_Connections_new_directions_in_drawing_and_cognition_research) [accessed: Sept. 2017].
- Bringhurst, R., 1992. *The elements of typographic style*. Vancouver, BC: Hartley and Marks.
- Brownlee, J., 2015. The Kindle Finally Gets Typography That Doesn't Suck. Fast Company [online]. Available at: <https://www.fastcompany.com/3046678/the-kindle-finally-gets-typography-that-doesnt-suck> [accessed February, 2016.]
- Buchli, V. ed., 2002. *The material culture reader*. Oxford: Berg.
- Cain, S., 2017. Ebook sales continue to fall as younger generations drive appetite for print. *The Guardian*, [online] Tuesday, 14 March. Available at: <https://www.theguardian.com/books/2017/mar/14/ebook-sales-continue-to-fall-niels-en-survey-uk-book-sales>. [accessed Sept 2017].
- Calahan, A., 2002. *Type trends and fashion*. New York: Mark Batty Publisher.
- Camargo, A., 2016. How Digital Technologies Are Affecting Attention Systems. Huffington Post [blog]. Updated 7 July 2017. Available at: [https://www.huffingtonpost.co.uk/araceli-camargo/how-digital-technologies-\\_b\\_10834340.html](https://www.huffingtonpost.co.uk/araceli-camargo/how-digital-technologies-_b_10834340.html) [accessed: Aug 2018].
- Campbell, L. 2018. British publishing breaks revenue records but textbook sales are hit. *The Bookseller* [online]. Available at: <https://www.thebookseller.com/news/british-publishing-houses-break-all-revenue-records-textbook-sales-take-hit-833321>. [accessed May 2019].
- Camus, A., 1967. *The Myth of Sisyphus and Other Essays*, translated by J. O'Brien, New York: Alfred Knopf
- Carr, N., 2010. *The shallows: how the internet is changing the way we think, read and remember*. London: Atlantic books.
- Carr, N., 2015. *The glass cage*. London: The Bodley Head.
- Carreira da Silva, F., 2016. The difficulty with materiality. [Email] (Personal communication).



Centre for Material Texts, n.d. Welcome to the Cambridge Centre for Material Texts [online]. <http://www.english.cam.ac.uk/cmt/> [accessed: Jan 2016].

Chappell, W. and Bringhurst, R., 1999. *A short history of the printed word*. Vancouver: Hartley & Marks Publishers.

Chowdhury, G., 2010. From digital libraries to digital preservation research: the importance of users and context, *Journal of Documentation*, Vol. 66 Issue: 2, pp.207–223, <https://doi.org/10.1108/00220411011023625>

Clark, A and Chalmers, D., 1998. *The extended mind*. In: R. Menary ed., 2011. *The extended mind*. Cambridge, MA: MIT press.

Clark, A., 2004. *Natural born cyborgs: minds, technologies, and the future of human intelligence*. Oxford: Oxford University Press.

Clark, A., 2008. *Supersizing the mind*. Oxford/New York: Oxford University Press.

Clark, A., 2013. Gesture as thought? In: Z. Radman, ed. *The hand an organ of the mind*. 2013. Cambridge, MA: MIT Press.

Clarke, A. J. ed., 2011. *Design anthropology*. Vienna: Springer-Verlag.

Classen, C. ed., 2005. *The book of touch*. Oxford: Berg.

Classen, C., 2012. *Studies in sensory history: deepest sense: a cultural history of touch*. Champagne, IL: University of illinois Press.

Cocozza, P., 2017. How eBooks lost their shine: ‘Kindles now look clunky and unhip’. *The Guardian*, [online] Thursday, 27 April. Available at: <https://www.theguardian.com/books/2017/apr/27/how-ebooks-lost-their-shine-kindles-look-clunky-unhip-> [accessed Sept 2017].

Cooper, A., Gridneff, R. and Haslam, A., 2013. Letterpress: looking backward to look forward. [pdf] In: *AIGA Blunt: Explicit & Graphic Design Criticism Now*, Old Dominion University, Norfolk, Virginia, USA, April 12-14, 2013. Available at: <http://eprints.brighton.ac.uk/13027/> [accessed: Sept 2013].

COST. European Cooperation in Science and Technology, 2016. What is E-READ. [online] Available at: <http://ereadcost.eu/about-e-read/> [last accessed: Sept 2018].

Coughlan, S., 2015. Digital dependence ‘eroding human memory’. *The Guardian* [online]. Wednesday, October 7. Available at: <https://www.bbc.co.uk/news/education-34454264> [accessed May 2017.]

Crawford, M. B., 2015. *The world beyond your head: how to flourish in an age of distraction*. New York: Farrar, Straus and Giroux.

Crawford, M., 2009. *A case for working with your hands*. Reprint 2010. London: Viking.

Creative Industries Council, n.d. Publishing facts and figures. [online] Available at: <http://www.thecreativeindustries.co.uk/industries/publishing/publishing-facts-and-figures> [accessed: March 2018].

Cross, N., 2001. Designerly ways of knowing: design discipline versus design science. [online] *Design Issues*, 17(3) pp. 49–55. <http://oro.open.ac.uk//3281/1/> [accessed: 11 Mar 2018].

Crotty, M., 1998. *The foundations of social research*. Thousand Oaks, CA/ London: Sage Publications.

Damasio, A. 2018. *The strange order of things*. New York: Random House Inc.

de Vignemont, F., 2016. Bodily awareness. [pdf] *The Stanford Encyclopedia of Philosophy* (Summer), E. N. Zalta ed., Available at: <https://plato.stanford.edu/archives/spr2018/entries/bodily-awareness/> [accessed: Sept 2015].

DeNicola, L., 2011. The internet, the parliament and the pub. In: A. J. Clarke ed., *Design Anthropology*. Vienna: Springer-Verlag.

Donath, J., 2011. Pamphlets, paintings, and rograms: faithful reproduction and untidy generativity in the physical and digital domains. In: T. Bartshcerer and R. Coover (eds). *Switching codes*. Chicago, IL: University of Chicago Press

Dormer, P., 1997. *The culture of craft*. Manchester: Manchester University Press.

Doubleday, R. B., 2006. *Jan Tschichold designer: the Penguin years*. New Castle, DE/Aldershot: Oak Knoll Press/Lund Humphries.

Douglass, B. G and Moustakas, C., 1985. Heuristic Inquiry: The Internal Search to Know. *Journal of Humanistic Psychology*, 25(3), 39–55. Doi: 10.1177/0022167885253004.

Drucker, J., 2013. From boundaries and protocols: the current condition(s) of the book. In: CREST (Consortium for Research Excellence, Support and Training), *The resurrection of the book conference*. Birmingham, UK, 15-17 Nov 2013. Birmingham: Newman University.

Eagleton, C., 2015. On the panel at books and the human, In: *AHRC 10th Anniversary Debate*. London, 16 Dec.

- Edwards, S., Lockhart, J. and Raein, M., 2002. Codex. In: *Twentieth Century Graphic Communication: Technology, Society and Culture*. St Bride Library, London. 24–25 2002. London: London Metropolitan University.
- Elliot, S. and Rose, J. eds., 2009. *The history of the book*. Hoboken, N.J: Blackwell Publishing Ltd.
- Fairhurst, M., 2014. Not 5 but 33 senses. *Arts & Humanities Research Council*, [blog] 12 June. Available at <https://www.sciculture.ac.uk/2014/06/12/not-5-but-33-senses/> [accessed: Feb 2017].
- Fallman, D., 2008. The interaction design research triangle of design practice, design studies and design exploration. *Design issues*, vol 23(3). Cambridge, Mass: MIT.
- Fava, S., 2018. Discussion of digital processes and photography. [conversation] (Personal communication, May 21, 2018).
- Feather, J., 2006. *A history of British book publishing*. London: Routledge.
- Figdor, C. 2013. What is the “Cognitive” in Cognitive Neuroscience? [online] *Neuroethics* 6 (1), 105–114. Doi: 10.1007/s12152-012-9157-5.
- Finklestein, D. and McCleery, A. eds., 2005. *The book history reader*. London: Routledge.
- Finklestein, D. and McCleery, A. eds., 2013. *An introduction to book history*. London: Routledge.
- Flood, A., 2018. ‘Ebooks are stupid’, says head of one of world’s biggest publishers. *The Guardian* [online]. Tuesday 20 February. Available at: <https://www.theguardian.com/books/2018/feb/20/ebooks-are-stupid-hachette-livre-arnaud-nourry>. (Accessed Aug 2018.)
- Flynn, B., 2011. Maurice Merleau-Ponty. [pdf] *Stanford Encyclopedia of Philosophy*, (Fall) E. N. Zalta ed. Available at: <http://plato.stanford.edu/archives/fall2011/entries/merleau-ponty/> [accessed: Dec 2013].
- Fontana, A., 2001. Postmodern trends in interviewing. In: J. F. Gubrium and J. A. Holstein, eds. 2001. *Handbook of interview research*. Thousand Oaks, CA/ London: Sage Publications.
- Emigre, n.d. [online] Available at <https://www.emigre.com/Fonts/Mrs-Eaves>. Accessed May 2019.
- Gadd, I. ed., 2013. *History of Oxford University Press: Volume I: Beginnings to 1780*. Oxford: Oxford University Press.

- Gallagher, S. and Zahavi, D., 2008. *The phenomenological mind*. London: Routledge.
- Gallagher, S., 2006. *How the body shapes the mind*. Reprint 2013. Oxford: Oxford University Press.
- Gallagher, S., 2008. Philosophical antecedents of situated cognition. In: P. Robbins and M. Aydede eds., 2008, *The Cambridge Handbook of Situated Cognition*. Cambridge: Cambridge University Press.
- Gallagher, S., 2013. The enactive hand. In: Z. Radman ed., *The hand, the organ of the mind*. London: MIT Press, pp209-226.
- Gibson, J. J., 1979. *The ecological approach to visual perception*. Reprint 1986. London: Routledge.
- Gleick, J., 1992. *Genius: the life and science of Richard Feynman*. New York: Pantheon Books.
- Gonzales Crisp, D., Temple and Davis, M., 2012. *Typography: graphic design in context*. London: Thames and Hudson.
- Grunwald, M. ed., 2008. *Human haptic perception: basics and applications*. Basel: Birkhauser Verlag AG.
- Gubrium, J. F and Holstein, J. A., eds. 2001. *Handbook of interview research*. Thousand Oaks, CA/London: Sage Publications.
- Hall, P., 2004. Surfing or special effects? Design inquiry. *Eye Magazine*, [e-journal] 54(14). Available at: <http://www.eyemagazine.com/opinion/article/surfing-or-special-effects-design-inquiry> [accessed: 8 Jan 2014].
- Hayler, M. 2011. *Incorporaing technology: A phenomenological approach*. PhD. University of Exeter. Available at: <http://hdl.handle.net/10036/3615> [accessed: May 2014].
- Hayler, M. 2016. Matter matters. In: G. Griffin and M. Hayler (eds). *Research methods for reading digital data in the digital humanities*. Edinburgh: Edinburgh University Press.
- Heft, H., 2003. Affordances, dynamic experience, and the challenge of reification. *Ecological Psychology*, 15(2), pp149–180.
- Heft, H., 2010. Affordances and the perception of landscape: an inquiry into environmental perception and aesthetics. In C.W. Thompson, P. Aspinall, and S. Bell eds., *Innovative approaches to researching landscape and health*. pp. 9–32. London: Routledge.

- Heidegger, M., 1954. *The question concerning technology and other essays*. Translated from German by W. Lovitt, 1977. New York: Harper & Row.
- Hendel, R., 1998. *On book design*. Newhaven, CT/London: Yale University Press.
- Hendel, R., 2013. *Aspects of contemporary book design*. Iowa City, IA: University of Iowa Press.
- Hewson, R., 1994. *Marking and making: a characterisation of sketching for typographic design*. PhD. Open University.
- Hiles, D., 2002. Narrative and heuristic approaches to transpersonal research and practice. [Online] In: CCPE. London. October. Available at: <http://psy.dmu.ac.uk/drhiles/N&Hpaper.htm>. Accessed Jan 2014.
- Hochuli, J. and Kinross, R. 1996. *Designing books: practice and theory*. London: Hyphen press.
- Howes, D. ed., 2006. *Empire of the senses*. Oxford: Berg.
- Howes, D., n.d. The aesthetics of mixing the senses. [pdf] Cross-Modal Aesthetics. S.l/s.n. Available at: <https://www.david-howes.com/senses/aestheticsofmixingthesenses.pdf> [accessed: May 2015].
- Howes, D., 2013. *The expanding field of sensory studies*. [online] Montreal: Centre for Sensory Studies, Concordia University. Available at: <https://www.sensorystudies.org/sensorial-investigations/the-expanding-field-of-sensory-studies/> [accessed: May 2016].
- Ihde, D. 1990. *Technology and the lifeworld: from garden to earth*. Bloomington: Indiana University Press.
- Ihde, D. 1991. *Instrumental realism: the interface between philosophy of science and philosophy of technology*. Bloomington, IN: Indiana University Press.
- Introna, L., 2011. Phenomenological approaches to ethics and information technology. [pdf] *The Stanford Encyclopedia of Philosophy* (Summer), E. N. Zalta (ed.). Available at <<https://plato.stanford.edu/archives/fall2017/entries/ethics-it-phenomenology/>> [accessed: Jan 2014].
- Johns, A., 1998. *The nature of the book: print and knowledge in the making*. Chicago/London: The University of Chicago Press.
- Johnson, M., 2001. In-depth interviewing. In: J. F. Gubrium and J. A. Holstein, eds. 2001. *Handbook of interview research*. Thousand Oaks, CA/London: Sage Publications.

- Jonas, H., 2010. *Philosophical essays: from ancient creed to technological man*. L. E. Long (ed.). New York: Atropos Press.
- Jungchul Kim, Myoung-Woon Moon, Kwang-Ryeol Lee, L. Mahadevan, and Ho-Young Kim. 2011. Hydrodynamics of writing with ink. *Physical Review Letters*, [e-journal] 107(26), 26 Dec. Doi: 10.1103/PhysRevLett.107.264501.
- King, E., 1999. *New faces*. PhD. Kingston University London.
- Kinross, R. 1992. *Modern typography*. London: Hyphen Press.
- Kinross, R., 2011. *Unjustified texts: perspectives on typography*. London: Hyphen Press.
- Kirschenbaum, M. G., 2012. *Mechanisms new media and the forensic imagination*. Cambridge, MA: MIT Press.
- Klatzky, R., 2015. Sense, perception and cognition. [Email] (Personal communication, 22 May).
- Klatzky, R. and Lederman, J., 2002. Haptic space perception. [pdf] Touch. (accepted for publication in 2003). Doi: 10.1.1.128.3816.
- Krpan, D., and Schnall, S., 2014. Too close for comfort: Stimulus valence moderates the influence of motivational orientation on distance perception. *Journal of Personality and Social Psychology*, 107(6), 978-993. Doi: 10.1037/pspa0000017.
- Kvale, S., 2009. *Doing Interviews*. Thousand Oaks, CA/London: Sage Publications.
- Lederman, S. J. and Klatzky, R. L., 2009. Haptic perception: a tutorial. [online] *Attention, Perception, & Psychophysics*. Doi: 10.3758/APP.71.7.1439.
- Lederman, S., 2015. Sense, perception and cognition. [Email] (Personal communication, 22 May).
- Lester, S., 2018. Some thoughts on traditional and digital tools. [Email] (Personal communication, 24 May).
- Levy, D., 2011. *Scrolling forward: making sense of documents in the digital age*. New York: Arcade Publishing.
- Ling-Yi Lin, Rong-Ju Cherng & Yung-Jung Chen. 2017. Effect of Touch Screen Tablet Use on Fine Motor Development of Young Children. *Physical & Occupational Therapy In Pediatrics*, 37:5, 457–467, Doi: 10.1080/01942638.2016.1255290.

- Long, N. and Long, S. eds., 2006. *S book 3: interviews with typographers*. Southampton UK: Southampton Solent University.
- Long, P. O. and Siddiqi, A., (eds), n.d. *Historical perspectives on technology culture and society*. [online] Eindhoven: SHOT Publications (Society for the History of Technology). Available at: <https://www.historyoftechnology.org/publications/historical-perspectives-on-technology-culture-and-society/> [accessed: 10 July 2016].
- Lowry, M. J.C., 1979. *The world of Aldus Manutius: business and scholarship in Renaissance Venice*. Ithaca, N.Y.: Cornell University Press.
- Luna, P., 2009. *Books and bits: texts and technology, 1970–2000*. In: S. Eliot and J. Rose, eds. *A companion to the history of the book*. London: Wiley-Blackwell.
- MacFadyen, H., 2011. The reader's devices: the affordances of ebook readers. *Dalhousie Journal of interdisciplinary management*, 7, n.p. Available at: <https://ojs.library.dal.ca/djim/article/view/2011vol7MacFadyen> [accessed: July 2016].
- MacKenzie, R., Marks, A. and Morgan, K., 2015. Technology, affordances and occupational identity amongst older telecommunications engineers: from living machines to black boxes. [online] *Sociology*, pp1–17. Doi: 10.1177/0038038515616352
- Macpherson, F. ed., 2011. *The senses and contemporary philosophical perspectives*. Oxford/New York: Oxford University Press.
- McGilchrist, I., 2012. *The master and his emissary: the divided brain and the making of the western world*. New Haven, CT/London: Yale University Press.
- McKenzie, D. F., 2002. *Making meaning: printers of the mind and other essays*. Eds Peter D. McDonald, Michael Felix Suarez. Amherst, MA: University of Massachusetts Press.
- Malafouris, L., 2013. *How things shape the mind*. 2013. Cambridge, MA: MIT Press.
- Mangen, A. 2016. What hands may tell us about reading and writing. *Educational Theory*, 66(4), pp431–576. Doi: 10.1111/edth.12183 .
- Mangen, A. and Van der Weel, A., 2016. The evolution of reading in the age of digitisation: an integrative framework for reading research. [pdf] *Literacy*, 50(3), Sept., pp116–124. Available at: <https://onlinelibrary.wiley.com/doi/epdf/10.1111/lit.12086> [accessed: November, 2016].



- Mark, L. S., Balliet, J. A., Craver, K. D., Douglas, S. D., and Fox, T. 1990. [online] What an actor must do in order to perceive the affordance for sitting. *Ecological Psychology*, 2 (4), 325–366. Doi: 10.1207/s15326969eco0204\_2.
- Marsh, 2015. The Faber Letterpress. [blog] 1 June. Available at: <https://www.faber.co.uk/blog/the-faber-letterpress/>. [accessed: 25 Jan 2016].
- Mason, C., 2013. Follow the book!. In: *Stories from the fold*, St Bride Library, London, 18 Sept. London: St Bride Library.
- Menary, R. ed., 2010. *The extended mind*. Cambridge, MA: MIT Press.
- Michelfelder, D. P., 2010. The philosophy of technology when “things ain’t what they used to be.” [online] In: *Techné: Research in Philosophy and Technology*, 14(1), Winter, pp60-68. Doi: 10.5840/techne20101419
- Miller, D. ed., 2005. *Materiality*. Durham, NC: Duke University Press.
- Miller, D., 2008. *The comfort of things*. Cambridge: Polity Press.
- Miller, D., n.d. *Materiality: an introduction*. [online] London: UCL. Available at: <https://www.ucl.ac.uk/anthropology/people/academic-and-teaching-staff/daniel-miller/materiality-introduction> [accessed: Aug 2017].
- Mims, C., 2010. Predicting the Death of Print. *MIT technology review*. [online] Available at: <https://www.technologyreview.com/s/420329/predicting-the-death-of-print/> [accessed: Feb 2018].
- Mitcham, C. 1994. *Thinking through technology: the path between engineering and philosophy*. Chicago/London: University of Chicago Press.
- Molotch H. 2011. Objects in sociology. In: A. J. Clarke ed., *Design anthropology*. Vienna: Springer.
- Morozov, E., 2013. *To save everything click here*. London: Allen lane.
- Moustakas, C. 1990. *Heuristic Research*. Thousand Oaks, CA/London: Sage Publications.
- Murray, D, 2012. On the limits of software. [conversation]. (Personal communication, Sept 11)
- Myerson, J., 1997. Tornadoes, T-squares and technology: can computers be a craft? In: P. Dormer, ed. *The Culture of Craft*. Manchester: Manchester University Press, pp176–189.



- Naughton, J., 2018. Wanted in the digital monopoly age – powers to curb the hold of online giants. *The Guardian* [online] 16 Sept. Available at: <https://www.theguardian.com/commentisfree/2018/sep/16/wanted-in-digital-monopoly-age-powers-to-curb-online-giants> [accessed: September, 2018.]
- Norman, D. A., 1998. *The design of everyday things*. Cambridge, MA: MIT Press.
- Norman, J., n.d. Trithemius favors vellum over paper for long term information storage (1494) [online] Available at: <http://www.historyofinformation.com/expanded.php?id=392>, Accessed: June 2018.
- Nye, D., 2007. *Technology matters: questions to live with*. Cambridge, MA: MIT Press.
- O'Regan J. K., 1992. Solving the “real” mysteries of visual perception: the world as an outside memory. *Canadian Journal of Psychology* 46(3), Sept., pp461-88. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/1486554> [Feb 2016].
- Olsen, J. K. B., 2009. Becoming through technology. In: J.K.B. Olsen, E. Selinger and S. Riis eds., *New waves in philosophy of technology*. London: Palgrave MacMillan, pp. 40-61.
- Olsen, J. K. B., Selinger, E and Riis, S., 2009. *New waves in philosophy of technology*. London: Palgrave MacMillan.
- Ong, W. J., 1977. *Interfaces of the world: studies in the evolution of consciousness and culture*. Ithaca and London: Cornell University Press.
- Ong, W. J., 1982. *Orality and literacy*. London: Routledge.
- Pallasmaa, J., 2009. *The thinking hand: existential and embodied wisdom in architecture*. Chichester: John Wiley & Sons: Chichester.
- Paterson, M., 2007. *The senses of touch: haptics, affects and technologies*. Oxford: Berg.
- Peachey, 2018. On publishing models. [Conversation]. (Personal communication, Mar 22).
- Pearson, D., 2017. Number of books sold. [Email] (Personal communication, Oct 13).
- Piper, A., 2015. The distributed book. In: Royal College of Art, *Ecologies of publishing futures symposium*. London 23 Nov 2015. Montreal: NovelTM, McGill University.

- Pitt, J. C., 2000. The technological twist. In: *Techné: Research in Philosophy and Technology*, 14(1), Winter, pp69-71. Doi: 10.5840/techne201014110.
- Phillips, A., 2014. *Turning the page: the evolution of the book*. Abingdon: Routledge.
- Plato. 1938. *Phaedrus, Ion, Gorgias and Symposium, with Passages from the Republic and Laws*. Lane Cooper, trans. London: Oxford University Press.
- Polanyi, M., 1958. *Personal knowledge: towards a post-critical philosophy*. Reprint 1983. Abingdon: Routledge.
- Preston, A., 2017. How real books have trumped ebooks. *The Guardian* [online]. Available at: <https://www.theguardian.com/books/2017/may/14/how-real-books-trumped-ebooks-publishing-revival>. May 14. Accessed Mar 2017.
- Publishers Association, 2017. UK *Publishing has record year up 7% to £4.8bn*. [online] 26 Apr. Available at: <https://www.publishers.org.uk/news/press-releases/2017/uk-publishing-has-record-year-up-7-to-48bn/>
- Radman, Z. ed., 2013. *The hand, an organ of the mind*. Cambridge, MA: MIT Press.
- Ralón, L., 2011. Interview with Evan Selinger. *Figure/Ground* [e-journal], 3 Aug. Available at: <http://figureground.org/interview-with-evan-selinger/> [accessed: Oct. 2015].
- Ramanathan, R., 2015. #1, #2, #3: Three provocations on publishing. In: Royal College of Art, *Ecologies of publishing futures symposium*. London. 23 November, 2015.
- Ray Murry, P. and Squires, C., 2012. The digital communications circuit. In: *The book unbound: disruption and disintermediation in the digital age*. Stirling: University of Stirling. Available at: <https://www.bookunbound.stir.ac.uk/research/infographic/> [accessed: Nov 2016].
- Raynsford, A. 2009. *Empathy and embodiment in contemporary art*. Art History 282B. [Syllabus] Spring. San José State University. Available at [http://www.anthonyraynsford.net/Syllabus\\_ArtHist\\_282BSyl\\_Sec1\\_Spring09.pdf](http://www.anthonyraynsford.net/Syllabus_ArtHist_282BSyl_Sec1_Spring09.pdf) [accessed: Nov 2016].
- Rescorla, M., 2015. The computational theory of mind. *Stanford Encyclopedia of Philosophy* [online]. Winter. E. N. Zalta ed. Available at: <http://plato.stanford.edu/archives/win2015/entries/computational-mind/>. [accessed: Apr 2016].
- Rigley, S., 2005. Essay Letterpress Thinking in solid air. *Eye* 57(15), Autumn, pp36–43.

- Rigley, S., 2013. Keys Cut. [online] Available at: <http://www.shadowcabinet.org.uk/writing-4.html> [accessed: 8 Dec 2016].
- Riis S. 2009. The question concerning thinking. In: J.K.B. Olsen, E. Selinger, S. Riis eds., *New waves in philosophy of technology*. London: Palgrave Macmillan.
- Ritter, H. and Haschke H., 2015. Hands, dexterity, and the brain. [online] In: G. Cheng ed., *Humanoid robotics and neuroscience: science, engineering and society*. Boca Raton, FL: CRC Press/Taylor Francis. Available at: [https://www.ncbi.nlm.nih.gov/books/NBK299038/#\\_ch3\\_sec5\\_](https://www.ncbi.nlm.nih.gov/books/NBK299038/#_ch3_sec5_) [accessed: 22 Apr 2018].
- Rose, J., 2009. Britain 1890–1970. In: S. Eliot and J. Rose, eds. *A companion to the history of the book*. London: Wiley-Blackwell.
- Ross, J. 2018. Discussion on hand vs CAD architectural drawing. [conversation] (Personal communication, March 9).
- Rubin, H and Rubin, I. 1995. *Qualitative Interviewing: The Art of Hearing Data*. Thousand Oaks, CA/London: Sage Publications.
- Runciman, D., 2018. How democracy ends. In: Cambridge University, *Festival of Ideas*. Cambridge UK, [October 20]. Cambridge: Cambridge University.
- Sacasas, M., 2013. The tourist and the pilgrim.[pdf]. S.l:s.n. Available at: <https://gumroad.com/l/UQBM> [accessed: 30 Jul 2013].
- Saikaly, F., n.d. Approaches to design research: towards the designerly way. [pdf] s.l/s.n. Available at: <https://pdfs.semanticscholar.org/dd2a/56a6b770dd817030ce58ee6b784fbc7ad889.pdf> [accessed: Nov 2014].
- Sax, D., 2016. *The revenge of the analog: real things and why they matter*. New York: PublicAffairs.
- Searls, D. 2012. *The intention economy*. Boston, Mass: Harvard Business Review Press.
- Sennett, R., 2008. *The craftsman*. Reprint 2009. London: Penguin.
- Shapiro. L., 2011. *Embodied cognition*. Abingdon: Routledge.
- Shaw, P., 1984. Tradition and Innovation: The Design Work of William Addison Dwiggins. [online] *Design Issues*. Vol. 1(2) pp. 26–41. DOI: 10.2307/1511497
- Silverman, D., 2010. *Doing Qualitative Research*. Thousand Oaks, CA/London: Sage Publications.

- Smeijers, F., 1996. *Counterpunch*. London: Hyphen Press.
- Smith, A., 1998. Preservation in the Future Tense. *CLIR Issues*. 3. Available at: <https://www.clir.org/1998/05/clir-issues-number-3/> [accessed: Aug 2017].
- Smith, J., Flowers, P. and Larkin, M., 2013. *Interpretative phenomenological analysis*. London: SAGE Publications.
- Southall, R., 2005. *Printer's type in the twentieth century: manufacturing and design methods*. London: British Library Publishing.
- Souttar, J., 2000. In: G. Swanson ed., 2000. *Graphic design and reading: explorations of an uneasy relationship*. New York: Allworth Press.
- Steinberg, S. H. and John Trevitt (ed.), 1996. *Five hundred years of printing*. London: The British Library.
- Stevenson, I., 2010. *Book Makers: British Publishing in the Twentieth Century*. London: British Library Publishing.
- Stoffregen, T. A. and Mantel, B., 2015. Exploratory movement and affordances in design. [online] *Artificial intelligence for engineering design, analysis and manufacturing*. 29, pp257-265. Doi: 10.1017/S0890060415000190
- Tanaka, S., 2011. The notion of embodied knowledge. In P. Stenner, J. Cromby, J. Motzkau, J. Yen, & Y. Haosheng eds., *Theoretical psychology: global transformations and challenges* (pp. 149–157). Concord, Canada: Captus Press.
- Thompson, E. 2017. The Enactive Approach. The brains blog [blog] 27 Jan. Available at: <http://philosophyofbrains.com/2017/01/27/the-enactive-approach.aspx> [accessed: 23 Feb 2018].
- Thompson, J., 2005. *Books in the Digital Age: The Transformation of Academic and Higher Education Publishing in Britain and the United States*. Cambridge: Polity Press.
- Thompson, J., 2010. *Merchants of Culture: The Publishing Business in the Twenty-First Century*. Cambridge: Polity Press.
- Typefi, 2015. Industry solutions: standards publishing. [online] Available at: <https://www.typefi.com/?s=a+traditional+publishing+workflow+is+the+separation+of+content+from+layout> [accessed: Jan 2016].
- Uzanne, O., 1894. *The end of books*. Reprint 2014. Adelaide, AU: eBooks@Adelaide, University of Adelaide.
- Van Gelder, T. 1995. What cognition might be, if not computation, *Journal of Philosophy* 92 (7), 345–381. Doi: jphil199592719.

- Varela, F., Thompson, E. and Rosch, E. 1995. *The embodied mind: cognitive science and human experience*. Cambridge, MA: MIT Press.
- Verbeek, P.P., 2005. *What things do*. University Park, PA: Penn State University Press.
- Warde, B. 1955. *The crystal goblet: sixteen essays on typography*. London: Sylvan Press.
- Williamson, H., 1983. *Methods of book design: the practice of an industrial craft*. New Haven, CT/London: Yale University Press.
- Wilson, A. and Foglia, L., 2011. Embodied cognition. [pdf] *Stanford Encyclopedia of Philosophy*, (Fall) E. N. Zalta ed. Available at: <http://plato.stanford.edu/archives/fall2011/entries/embodied-cognition/> [accessed: Nov 2014].
- Wilson, F. R., 1999. *The hand*. New York: Vintage Books.
- Wilson, M., 2002. Six views of embodied cognition. *Psychonomic Bulletin & Review* 9 (4), pp625-636.
- Wolf, J. R., Arkes, H. R., and Muhanna, W. A. 2008. The power of touch: an examination of the effect of duration of physical contact on the valuation of objects. [online] *Judgment and Decision Making*, 3(6), August, pp. 476-482. Available at: <http://journal.sjdm.org/8613/jdm8613.html> [accessed: Aug 2018].
- Wolf, M., 2008. *Proust and the squid*. Cambridge UK: Icon Books.
- Wolpert, D., 2011. The real reason for brains. TEDGlobal. Available at: [https://www.ted.com/talks/daniel\\_wolpert\\_the\\_real\\_reason\\_for\\_brains/transcript?language=en](https://www.ted.com/talks/daniel_wolpert_the_real_reason_for_brains/transcript?language=en) [accessed: Jan 2017].
- Wynkyn de Worde Society, n.d. *History of the Wynkyn de Worde Society*. [online] Available at: <http://www.wynkyndeworde.co.uk/history/> [accessed: DATE]. In-line citation, you're correct: (Wynkyn de Worde Society, n.d.).
- Yee, J., 2006. *Developing a practice-led framework to promote the practice and understanding of typography across different media*. PhD. Northumbria University, School of Design.
- Yee, J. S. R., 2010. Methodological innovation in practice-based design doctorates. *Journal of Research Practice*, 6(2), Article M15. Available at: <http://jrp.icaap.org/index.php/jrp/article/view/196/193> [accessed: Mar 2014].
- Zimmerman, M., 2012. *Yes, Virginia, consciousness does go all the way down: integral thinking in cutting-edge neurophysiology: part one*. Available at: [https://www.academia.edu/8105982/Yes\\_Virginia\\_consciousness\\_does\\_go\\_all\\_the\\_way\\_down\\_Integral\\_thinking\\_in\\_cutting-edge\\_neurophysiology\\_Part\\_One](https://www.academia.edu/8105982/Yes_Virginia_consciousness_does_go_all_the_way_down_Integral_thinking_in_cutting-edge_neurophysiology_Part_One) [accessed: Nov 2017].

## **List of Diagrams**

1. Fallman's model of design research (simplified).....	22
2. Areas of enquiry: digital technology, haptic perception and design process. ....	36

## **List of Figures**

1. Book designed by David Pearson, published by White's Books .....	52
2. Examples of book design from Penguin Great Ideas series. ....	66
3. Pencil layout by Richard Eckersley .....	72
4. David Pearson's cover design for <i>The Symposium</i> , Plato .....	124