

A THESIS ABOUT DESIGN FICTION



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**This thesis is submitted for the degree of
Doctor of Philosophy**

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*Rich luxury resides in your eyes
But you're not in front of me
So I summon your eyes from my memory
And seeing you there
I long to dive in*

Dr Emma Lindley (1978-2013)

Declaration

This thesis has not been submitted in support of an application for another degree at this or any other University. It is the result of my own work and includes nothing that is the outcome of work done in collaboration except where specifically indicated. Many of the ideas in this thesis were the product of discussion with my supervisor Professor Paul Coulton. Excerpts of this thesis have been published in the following manuscripts.

Coulton, P. *et al.* (2017) 'Design Fiction as World Building', in *Proceedings of the 2nd Biennial Research Through Design Conference*. Edinburgh, UK.

Coulton, P. and Lindley, J. (2016) 'Game vaporware as design fictions', in *Proceedings of the 20th International Academic Mindtrek Conference*, New York, New York, USA: ACM Press, pp. 341–349. doi: 10.1145/2994310.2994313.

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Joseph Lindley

Abstract

This research began as something else. Originally, I sought to research the possible futures of cryptographic currencies, and I encountered Design Fiction for the first time when assembling a methodology for that project. I was enticed by the rhetoric around Design Fiction and the aesthetic of works describing themselves *as* Design Fiction. However, as I researched the concept more thoroughly it quickly became apparent that grounding an entire doctoral thesis on Design Fiction alone may be problematic due to a lack of consensus around what Design Fiction really is and how it works. Hence, my doctorate pivoted, and rather than *using* Design Fiction to research another topic, I elected to research Design Fiction *itself*.

Through desk-based research into Design Fiction the thesis establishes that while there are some central notions which seem common to Design Fictions (e.g. a concern with ‘the future’, the use of ‘design’, and a flavour of unreality invoked by the term ‘fiction’) there is little consensus around how these notions should be defined, how they interact with each other, and what—in concrete terms—the nature of the practice that emerges in the space between them really is. Responding to the apparent lack of consensus the thesis explores the following questions:

- *What is Design Fiction?*
- *What can Design Fiction do?*
- *What are the best ways to achieve that?*

In order to explore such fundamental conundrums—and guided by Bruce Sterling’s succinct assertion that ‘the best way to understand the many difficulties of design fiction is to attempt to create one’—my responses to these questions were developed using a *Research through Design* methodology to inform a series of ‘material engagements’ with Design Fiction. These are articulated through a series of ‘case studies’. Each case study uses Design Fiction to explore a different technology or context. These include cryptographic currency, robotic carers, drones, and artificial intelligence. Together the studies create a portfolio of material engagements with Design Fiction that, collectively, underpin contingent responses to the research questions.

The thesis concludes that Design Fiction is a type of ‘World Building’ that may be utilised in many different ways, for example as a communication tool, as an ideation aid, or as a research method. Furthermore, the underlying *intentionality* of any given Design Fiction must be expressed through appropriate media in order to support World Building that is sensitive to both the given domain’s attributes and the factors motivating the use of Design Fiction in the first place. While the Research through Design approach applied in this research aspires only to produce contingent and temporary answers to the research questions, those answers come together as a set of usable and accessible insights useful for unravelling, understanding, utilising Design Fiction, while fostering the practice’s ongoing maturation and adoption into its own near future.

Acknowledgements

I couldn't have done this doctorate without Paul Coulton's superb and substantive supervisory succour. To Paul: imagine a tightrope across a deep chasm; at one end there's an allegiance to triviality anchoring the rope, while at the other it's secured by is in indefatigable dedication to knowledge and insight—being your student largely involved watching you effortlessly skipping back and forth along this mysterious bridge, all the while watching, and slowly trying to learn the technique such that, one day, I might attempt the same merry dance. *Ta!*

Inasmuch as I can articulate their contribution in a handful of words, I'm indebted to my family for endless love and support. Mum, Dad, Sam, Emma: you taught me how to live in this peculiar world, *thank you*.

Sincere thanks to my examiners Nick Dunn and Nicolas Nova for their firm but fair critique, served with a side-dish of kindness.

Thank you to Gordon Blair, all of his work at the HighWire Centre for Doctoral Training, and all the wonderful friends I have made during my time there.

Everyone else: I'm always fearful about making lists of thanks on account of the risk of leaving somebody out, so, simply let it be said I feel incredibly lucky to have made so many incredible acquaintances in life and I'm hugely grateful to a plethora of people who, directly and indirectly, have helped me navigate this strange process. *Thank you everyone*.

Finally, I would like to acknowledge *the future*: I will see you, everyone I've already thanked, and everyone I'm yet to meet, when we get there.

Contents

1 INTRODUCTION.....	1
1.1 Introduction to the Introduction.....	1
1.2 Croatia to California: Destination Design Fiction.....	2
1.3 Design Fiction and Cross-inter-post-and-trans Disciplinary Boundaries.....	8
1.4 Thesis Structure.....	10
1.4.1 Chapter 1: Introduction.....	10
1.4.2 Chapter 2: Literature Review.....	10
1.4.3 Chapter 3: What Is This ‘Research’ Thing Anyway?.....	12
1.4.4 Chapter 4: Case Studies.....	13
1.4.5 Chapter 5. Contextualised Conclusions and Constructed Contributions.....	14
2 LITERATURE REVIEW.....	15
2.1 Design Fiction’s Shifting Landscape.....	15
2.2 A Brief History of Design Fiction.....	16
2.3 The State of Design Fiction’s Art.....	21
2.3.1 Steampunk as Design Fiction (2012).....	22
2.3.2 Anticipatory Ethnography: Design Fiction as an Input to Design Ethnography (2014).....	24
2.3.3 Taxonomies, Toolboxes and Typologies, and ‘The Like’.....	26
2.4 The Arts Around Design Fiction’s State.....	33
2.5 ‘Academic’ Means ‘Not of Practical Relevance’.....	35
2.6 Summary.....	35
3 WHAT IS THIS ‘RESEARCH’ THING ANYWAY?.....	37
3.1 Introduction.....	37
3.2 What Happened When Design Met Research?.....	41
3.3 Serving Up a Postmodern Assiette de RtD Épistémologie.....	44
3.3.1 Begin with a Roux of Postmodernism.....	45
3.3.2 Layer Slices of Constructivism.....	46
3.3.3 Add a Crust of Constructionism.....	47
3.3.4 Season Liberally with Research Methods.....	48
3.3.5 Tasting the RtD Pie.....	48
3.3.6 Pie Comes in Many Flavours.....	49
3.4 Designing a Research through Design Project.....	53
3.4.1 Research through Design; a HCI Hors d’oeuvre?.....	54
3.4.2 Bringing Together All the Elements on a Plate; Feasting on the Methodological Menu du Jour.....	60
3.4.3 Time to Wash the Dishes, and Doing Design Fiction Research through Material Engagement.....	61
3.4.4 A note: by Case Studies I mean Studies of Cases.....	63
4 CASE STUDIES.....	65
4.1 Overview of the Case Studies.....	65
4.2 Heating Britain’s Homes, the Bitcoin Radiator, and the Ministry of Crypto Finance.....	68
4.2.1 Introduction.....	68

4.2.2	<i>Context</i>	68
4.2.3	<i>Process</i>	71
4.2.4	<i>Domain Specific Insights</i>	79
4.2.5	<i>Design Fiction Insights</i>	80
4.2.6	<i>Summary</i>	81
4.3	<i>An Ethnography of the Future</i>	82
4.3.1	<i>Introduction</i>	82
4.3.2	<i>Context</i>	82
4.3.3	<i>Process</i>	85
4.3.4	<i>Domain Specific Insights</i>	86
4.3.5	<i>Design Fiction Insights</i>	90
4.3.6	<i>Summary</i>	91
4.4	<i>A Machine. Learning.</i>	92
4.4.1	<i>Introduction</i>	92
4.4.2	<i>Context</i>	92
4.4.3	<i>Process</i>	93
4.4.4	<i>Domain Specific Insights</i>	95
4.4.5	<i>Design Fiction Insights</i>	97
4.4.6	<i>Summary</i>	98
4.5	<i>Care for a Robot</i>	98
4.5.1	<i>Introduction</i>	98
4.5.2	<i>Context</i>	100
4.5.3	<i>Process</i>	101
4.5.4	<i>Domain Specific Insights</i>	104
4.5.5	<i>Design Fiction Insights</i>	106
4.5.6	<i>Summary</i>	108
4.6	<i>Game of Drones</i>	109
4.6.1	<i>Introduction</i>	109
4.6.2	<i>Context</i>	109
4.6.3	<i>Process</i>	110
4.6.4	<i>Domain Specific Insights</i>	114
4.6.5	<i>Design Fiction Insights</i>	120
4.6.6	<i>Summary</i>	123
4.7	<i>And, the rest</i>	123
4.7.1	<i>Introduction</i>	123
4.7.2	<i>Sans Duty: Making Tax Visible</i>	124
4.7.3	<i>The Near Future School, and the Future of the Academy</i>	127
4.7.4	<i>Lemon Difficult Consulting</i>	130
4.7.5	<i>FCDFE, “Fucduff”, of the (first) Fictional Conference on Design Fiction’s Futures</i>	132
4.7.6	<i>My Pre-Doctoral Post-Doctoral Research on PETRAS</i>	134

5 CONTEXTUALISED CONCLUSIONS AND CONSTRUCTED CONTRIBUTIONS 139

5.1	<i>Introduction to the Conclusions</i>	139
5.2	<i>What is Design Fiction?</i>	140
5.2.1	<i>Contextualising the Question</i>	140
5.2.2	<i>Design Fiction is World Building</i>	141
5.2.3	<i>Using World Building</i>	145

5.3 What can Design Fiction do?.....	148
5.3.1 <i>Contextualising the Question</i>	148
5.3.2 <i>From Research to Deceit: Design Fiction can ‘do’ Many Things</i>	149
5.3.3 <i>‘It depends’ is a fair answer; #NoPendantryIntended</i>	154
5.4 What are the best ways to do that?.....	154
5.4.1 <i>Contextualising the Question</i>	154
5.4.2 <i>Understand, Customise, Iterate</i>	155
5.5 Further Research and Design Fiction’s Futures.....	158
6 REFERENCES	162

List of Figures

Figure 1. I and Emma in about 1997.	4
Figure 2. Illustration by Miriam Sturdee originally created to support the arguments presented in <i>Implications for Adoption</i> (Lindley, Coulton and Sturdee, 2017). A caricature of Don Norman rides a ‘science bomb’ (inspired by Kong riding a nuke at the end of <i>Dr Strangelove</i>). The relevance here is a tangential link to case studies delivering an empirical ‘Payload’	13
Figure 3. Tabulated properties of Anticipatory Ethnography and its constituents.	25
Figure 4. Photo of Greg Desjardin, my early Research through Design tutor.	39
Figure 5. Diagram showing interactions between ‘design’ and ‘research’	44
Figure 6. Visualisation of how a portfolio of case studies interact to produce knowledge as part of an RtD process (After Pollastri, 2017).....	62
Figure 7. Mapping process, publications, case studies, insights and research questions.	67
Figure 8. Example of a homemade GPU-based mining machine.	72
Figure 9. Example (made up) headlines from the Design Fiction.....	73
Figure 10. Prototype-prototype of the Bitcoin Radiator. Two GPUs attached to a motherboard running the Scrypt mining algorithm. Note the additional fan between the two GPUs (in addition to their already highly specified heatsinks) that was necessary to dissipate the extreme heat. These GPUs run at 80°C when mining.....	74
Figure 11. Prototype of the Bitcoin Radiator with basic water cooling loop set up.....	75
Figure 12. Example of the Bitcoin miner attached to a wall-based radiator....	76
Figure 13. Marketing banners for the government backed Cryptoheat system.	78
Figure 14. Model of Design Fiction Derived from Heating Britain’s Homes Project.....	81
Figure 15. Screenshot of diegetic prototypes / props for the Samantha AI in <i>Her</i>	84
Figure 16. Affinity mapping during the ‘Anticipatory Ethnography’ of <i>Her</i> ..	85

Figure 17. Screenshot from the film in the section where we depict the machine trying to learn how to interpret Manu’s emotions.	94
Figure 18. “Red dots used to mean capture a recording. Now it means learn.” (see red dot in the frame’s bokeh, top-left of the notebook)	95
Figure 19. Screen grabs from the introduction of Care for a Robot showing the form-factor of the robot (footage reused from Robot and Frank under fair usage).	99
Figure 20. Ding Wang starring as ‘The Hacker’ in Care for a Robot.....	104
Figure 21. Early drone flying explorations were very useful to help understand the limitations and possibilities of the technology.....	111
Figure 22. Early test footage experimenting with the use of motion tracking to attach assets to objects within footage (e.g. to allow the boxes to track the cars).	112
Figure 23. The system caption in this still from the finished Game of Drones video reflected the fact that whilst flying on this occasion rain arrived unexpectedly. Although in practice drones used for enforcement would likely be water resistant, inclement weather would undoubtedly have an impact on the system’s overall performance.	113
Figure 24. Real world lamp post used to inspire drone landing station as seen from traditional camera (left) and drone camera (right). Note the ingress of the fixed camera tripod from the perspective of the drone camera.....	113
Figure 25. The ‘fictional’ paper’s ‘real’ entry in the ACM’s digital library..	114
Figure 26. Blueprint streetlamp-based drone landing station designed for Game of Drones (left, 2015) alongside streetlamp-based landing station patented by Amazon (right, 2016).	115
Figure 27. Crop image of the drone landing station map showing a small area of Lancaster City Centre. Parking control zones and popular dog walking routes are highlighted along with four landing stations.	116
Figure 28. Depiction of no-fly zone over a children’s play area and an automated system prompt to ‘Proceed with caution’.....	117
Figure 29. An example of the drone system’s computer vision attempting to identify faecal matter. In this case the human operator notes that it is not in fact faecal matter (in the video the black splodge is the drone’s own shadow).	118
Figure 30. Drone pilots starts recording the verbal abuse from an angry member of the public.....	118

Figure 31. Notification signage designed for the drone enforcement system and demonstrated in situ.	119
Figure 32. Slide used in a lecture about Design Fiction showing how overlapping synonyms of the word ‘Fiction’ can mean many different things. The meanings of words can be rather ontologically challenging.	121
Figure 33. The Game of Drones enforcement system trial used former police and military officers to pilot the drones. Personas were created for several trial pilots and used these to inform possible ways the system might be used.	122
Figure 34. Digital flyer inviting attendees to the initial workshop—tax-based themes replace Oxford Circus, Victoria and Vauxhall stations.....	124
Figure 35. Workshop 1, introducing Design Fiction to community members and Brixton Pound representatives.	125
Figure 36. Extract from Terry Veblem’s fictional campaign for ‘just tax’ in Brixton.....	126
Figure 37. Various shots of Brixton grabbed from the closing sequence of the Sans Duty film.	127
Figure 38. Example ‘Design Fiction’ in the form of an abstract from a speculative research paper written about an alternative funding scheme for UK Universities.	128
Figure 39. Blank social profile ‘worksheet’ used in the Near Future School project.....	129
Figure 40. Example summary of a pupil’s story, summarised during group discussions.	130
Figure 41. One of several banners created for the really fictional consultancy business <i>Lemon Difficult</i>	131
Figure 42. The (no longer updated) Twitter page for @lemonconsultant.	132
Figure 43. Logos developed to support the publicity for FCDF.	133
Figure 44. Extract showing some of the papers submitted to the conference.	134
Figure 45. Extract from a booklet describing the Polly kettle showing the kettle’s data event timeline.	135
Figure 46. Diagram detailing how a home would be wired into the Allspark system.	136

Figure 47. Prototype design for an Allspark washing machine. In this future non-urgent tasks such as washing clothes would be scheduled on a national level in order to optimise battery charge/discharge. Nudge techniques may be used to influence consumer behaviour.	136
Figure 48. Design concept generated using Carpentry.....	137
Figure 49. Still from a film showing how the Orbit design concept would exist within a connected product ecosystem, in this case to configure a smart door lock.....	137
Figure 50. Diagram showing the varying scales of entry points into a Design Fiction world.....	142
Figure 51. The reciprocal prototyping relationship that occurs in Design Fiction as World Building.....	144
Figure 52. Visualisation of Design Fiction world building using nested spheres.	146
Figure 53. Redacted email from film maker asking to produce a documentary about the entirely fictional Voight-Kampff machine.....	150
Figure 54. Graph used to illustrate how the ‘Duck Test’ articulates Design Fiction’s inherent ability to deceive.....	153
Figure 55. The futures cone, with no representation of the past or of subjectivity.	156
Figure 56. The hermeneutic model of the future featuring individual perspectives, and interplay between future, past, and present.....	156
Figure 57. A range of talks from the ??? session of the First Fictional Conference on Design Fiction’s Futures, not held in 2016 (Kirman <i>et al.</i> , 2018).....	159
Figure 58. A reflective self-portrait in the rear-review mirror (I guess it was ‘Me. Here. Now’). In this case the reflection suggests that 🖐️ <i>that</i> was a thesis about Design Fiction.	161

1 Introduction

1.1 Introduction to the Introduction

Making stuff up about the future. That is what this thesis is about. Of course, my decision to get the thesis ball rolling in a particularly jejune manner came about for a specific reason: you only get to choose the opening sentence of your PhD thesis once and sitting here ~~1254~~ ~~1534~~ ~~2017~~ 2053¹ days after I embarked on this doctoral journey—opening with flippant joviality seems like what I want to do. I don't imagine that *these words* will make it into the final version², and I'm hopeful that the self-indulgent tone of this inaugural paragraph doesn't contaminate what will ultimately follow and become the body of my thesis. This paragraph, and the words that make it up, will have to do for the time being however, as I don't want to wait for the 2054th day to begin before 'finishing the beginning' of my thesis write-up.

Of course, 'making stuff up about the future' does not encode the depth that I am attempting to represent through the thesis. The topics I address are actually quite specific and, as required, can be articulated more academically. 'Properly', if you like. Though lacking the irreverent tone that I intentionally try to build in to my writing, a more academic description of the work packs a rather more meaningful punch. So, here goes: this study uses a Research through Design approach to explore the notion of Design Fiction through a series of case studies (note that I do not mean I used a formal case study methodology, but rather my cases are 'a particular instance of something used or analysed in order to illustrate a thesis or principle'). As I write, this question has just surfaced, is the introduction finished now? As soon as the question arose in my mind, and I

¹ This period spans the 1st October 2012 to 16th May 2018. The crossed-out numbers represent the fact I was short-sighted enough to *not* realise I would have to update this number when I first wrote '1254'.

² It turns out this was a similarly short-sighted assumption, because they *have* made it to the final version.

typed out those words, a resounding “no” echoes out of my internal monologue. “You have to actually introduce some concrete concepts before the introduction is finished”.

So, to introduce things properly. In the remainder of the introduction I’ll eventually lead you down a path that deconstructs and explores the component parts of the précis above: Design Fiction, Research through Design, and an overview of my cases studies. In the space beyond that deconstruction I’ll give chapter overviews, to make it clear what to expect, and when, for the whole thesis. The concluding part of the introduction will be a few thoughts on *why* this particular research is relevant, both in general terms and also in terms of the digital economy programme that funded it.

However, before getting on to those somewhat cerebral matters I want to start with an autobiographical account of the months leading up to starting my PhD. While some would say that documents such as this thesis should be unimpeded by the likes of personal, subjective, journal-like content, such as what follows, I am confident that knowing how and why I came to be researching Design Fiction, may make the actual description of the research more engaging, enlightening, and enticing. As I will describe in later chapters, Design Fiction is not necessarily about narrative, but ‘story worlds’, in some way I include the following to invite you into this PhD’s story world. This reminds me of the way that folk singers often explain the context of their songs before singing them. It is always the song itself that is beautiful and powerful but describing the situations and contexts that surround the song somehow adds to the overall effect; I hope that is true with the following paragraphs.

1.2 Croatia to California: Destination Design Fiction

The particular PhD programme (called HighWire) that this thesis has been produced as part of is a so-called ‘one plus three’ course. The ‘one’ is a compulsory year studying for a Master’s degree in research methods (an ‘MRes’). In the case of HighWire, that Master’s programme was a bespoke construction of courses and lectures designed to support HighWire’s intention for its students to do ‘post disciplinary’ research, to support radical change and innovation, under the banner of the Research Councils UK’s Digital Economy funding scheme. The MRes year was hard work, extremely hard, but also good fun. For me part of the challenge was trying to assimilate the huge amount of learning that was being imparted to us and which was coming from the sometimes-incompatible disciplinary perspectives, particularly when I had no significant academic foundation to relate these new ideas to or compare them against. With support, hard work, and luck, I managed to produce all of the assessed pieces of work that were necessary to get through the MRes.

The final two assignments for the MRes are a research project culminating in a journal paper and/or Master’s thesis and also a proposal for the next three years of ‘proper’ PhD research. The proposal element is supposed to be an adaptation of the *original* proposal that each student submitted in order to be accepted on

Chapter 1: Introduction

the HighWire programme in the first place but should reflect the learning and development of the students during the MRes year. HighWire's director, Professor Gordon Blair, memorably said to my cohort that he would purchase any student a bottle of fine Scotch Whisky if their PhD proposal remained unchanged after the MRes. This indicates the intention to coerce students into diversifying their thinking, in order to then converge around a *better* proposal. By the end of the MRes, in September 2013, my original proposal was but a remnant of a distant memory; I had moved on months earlier and had become consumed by the task of finishing my Master's thesis.

That thesis had become a rather peculiar piece of work comprising of a film and a long essay. Through it I hoped that my 'research' would highlight what I perceived to be a whole raft of problems ranging from the potentially dubious concept of 'post disciplinarity' through to the partially 'undisruptable' paradigms and conventions around publishing academic research. The work I produced was self-indulgent, but indulgence aside hopefully interesting in some way while being commensurate with the quality of work expected. It represented the releasing of an accumulated pressure that had built up inside me. The pressure built and built as the 'far away' concept of actually starting the PhD evaporated, got closer, and became real. The resulting 'gas' was compressed by the intensity of the conflicting disciplinary interests I had been exposed to during the MRes. As if that wasn't enough the already situation inside me was vigorously stimulated by one more factor: I had no idea what I wanted to spend the next three years doing my PhD *about*. Not only had Gordon's prediction about my proposal come true, but the whole MRes process, combined with my cynicism about HighWire and academia as a whole, left me *clueless* as to how I should proceed. I felt overwhelmed by potential and apathetic about my ability to make any meaningful 'contributions to knowledge'. Nonetheless I was required, in order to pass the Master's, to write a proposal: I waited until the final day for submission and wrote the entire thing in under an hour (it was about using creative approaches to try and generate insights about climate change if you were wondering). Having submitted my thesis, *Add Researchers and Stir*, as well as my haphazard PhD proposal, I had a few recreational and social things lined up to do during September 2013.

I visited the south of England for a friend's wedding in Bath. I stayed with an ex-girlfriend in Bristol. From there I flew to Venice, before travelling over land to Croatia to meet a bunch of mates and attend a music festival. From the festival I was flying (again via Venice) directly to Greece where I would attend a two-week design workshop with my friend and collaborator Robert Potts. The day was the 15th September, I was waiting to board my flight to Greece where I would meet Robert. My mobile phone rang, my brother's name was on the screen. When I answered it was clear something was not right. What he told me changed my life. He told me that my sister had died that morning. She had asphyxiated herself with a polythene bag.

In these moments it felt like the space around me became an extremely viscous anthro-architectural fluid. The walls, ceiling, chairs, people and hubbub of the airport melted, falling down around me. It was as if the tears streaming down

A THESIS ABOUT DESIGN FICTION

my cheeks were at once a solvent, *and* the matter that made up the Universe; the suddenly-created black hole of sadness inside me was pulling everything towards me with filmic slowness. I really cannot explain it to you properly, and I realise I'm not the first person in the world to experience the kind of intense grief that is a free gift that comes hand-in-hand with tragic events like this, but *this was a moment*. Both a moment in terms of an instant in time, but also as the term is mean in physics, as a force acting on a subject at distance. This moment has acted on me like a lever ever since and I think it will continue to do so for ever. In the weeks and months after the 15th September 2013, worries about my PhD were faraway.



Figure 1. I and Emma in about 1997.

My sister, Emma, was in many ways, my best friend. We were incredibly close. We always loved each other, but a particularly tight bond developed when I was a teenager. We lived together for some time after she had moved from London back to our home town in Yorkshire, a move that was stimulated by her diagnosis with bipolar disorder (and diagnosis aside, the hugely impactful symptoms of her condition). Although there were years with no discernible symptoms, Emma did frequently suffer (and thrive through, for that matter) at the behest of this phenomenon. Around 2005 we both ended up living in Manchester, where we lived close by one another, saw each other regularly and had social circles with significant overlaps: best friends, but siblings too. During

Chapter 1: Introduction

that time, I completed my undergraduate degree, and Emma meanwhile studied for a PhD (which discusses stigma around mental health). Her suicide was unequivocally linked to the symptoms of bipolar. Her death was the end point of a particularly long and particularly disruptive episode. It has been three years since (at the time of writing this introduction, at least), and while the immediacy of pain has left my being, the memory of what I've lost is with me constantly. Emma undoubtedly lives on through me in some way, as well as many, many other people. She shaped the world and people around her, she shaped me. In so many, many ways, I wouldn't be writing *this* thesis if it weren't for her. But to describe how much influence Emma had on me, how much it hurt to lose her, and how much I miss her, is not the purpose of this section. The purpose is to explain how I arrived at researching Design Fiction, and what happened on the 15th September 2013 undeniably had something to do with it.

With the airport melting around the infinite gravity of sadness at my core, I had to decide what to do in the next few minutes. The airport was extremely busy with revellers returning from the music festival and I made a snap decision to board the flight to Athens. From there I would try and get back to England to be with my family on the same day. On arrival at Athens I liaised with my brother and it became clear there was only one flight that could get me back home, and the flight in question was scheduled to leave about 30 minutes after my inbound flight touched town on Greek soil. I forced my way through Athens airport, barging past queuing travellers in an attempt to get directly to the departure gate for the only flight that could—via Germany—get me back to my family. At the gate I shed more tears and pleaded with the airline's employees to let me on. It cost me a huge amount of money, but, somehow, they got me on to the flight. Many hours, and two aeroplanes later, I eventually landed back in Manchester. My friend Anisa Aslam ferried me by car back to my hometown in Yorkshire. My parents were in shock. They were quivering with sadness, and I did too. The next days and weeks were a blur of emotional outpouring, and for everyone touched by Emma's death there was a period of adjustment to the world without her in it any more.

By the 15th November 2013, two months after Emma's death, I had formulated a plan for how to get my life back towards some rhythm of normality. I had two big questions that I *needed* to address in order to start taking steps forward. First, I wanted to understand how could I deal with, and process, the feeling of loss that seemed immovable? Second, how could I (bearing in mind the drivers behind the first question) figure out what my vocation should be; should I continue studying for the PhD; and if yes, what should the area of inquiry be? My response to these questions was to plan a kind of research project that might be able to address them, and in this case that research project took the shape of a road trip. I decided to spend an indeterminate period travelling the world, visiting and staying with people whose opinions and thoughts I cared about. I used a free-form interview and mind mapping technique to try and discern answers to those questions. I wanted to end by creating a 'pattern language for discernment' (cf. Alexander, 1977; Schuler, 2008).

A THESIS ABOUT DESIGN FICTION

As is so often the case my plan quickly adapted and changed shape while it was in action. Rather than visiting a new person on every single day I took breaks in between. Rather than doing a daily analysis of the data I collected, as planned, I just recorded the data and then let an essence of its meaning emerge within me (this is probably the primary reason that I never ever got around to formally analysing the data). I had some wonderful-yet-challenging and heart-warming-but-painful conversations with the folks I visited on that trip³. The depth and detail of all of the conversations that made up my trip *really did help*. It helped me to digest my grief. It didn't go away, I don't think it ever will, but I learned to hold the concept of it in my mind and still be able to function alongside it. I think it was the talking that helped me to do that, along with a dose of time. At the same time through all of these conversations I began to solidify my feelings towards what I wanted to study for my PhD.

I came to a firm conclusion, and that was that my PhD should address the future of the cryptographic currency system, Bitcoin. The day I came to that conclusion I was staying with my good friend Matthew Colledge. We drank beers, we ate food, we talked at length. Eventually Matthew went to bed. I stayed up and thought about Bitcoin and my PhD. I had considered researching Bitcoin for some time, but suddenly—and I'm not sure why to be honest—I was lucid about my aspirations and was ready to commit to this topic. I was content and happy in this lucidity. That part of my road trip, I began to think, had delivered on its aim. I slept soundly that night.

The next day I cancelled my remaining visitations and decided to go directly home instead. I figured that contemplating the Bitcoin-PhD concept would be more productive than going to visit even more people and perhaps opening up the possibility for my thoughts to diverge again. I also wanted to prepare for my upcoming trip to California. The West Coast of the United States was the farthest I reached away from home during my travels. It wasn't strictly speaking part of the road trip, I wasn't going to interview anyone there. Rather my purpose was to present some work derived from my Masters (a collaborative project about digitally-enabled altruism) to a conference hosted by the Centre for Compassion and Altruism Research at Stanford University. I'd never been to the United States of America before and so this part of my road trip was particularly eye-opening for me and it allowed me much time to ponder my decision to study Bitcoin in a variety of ways. These included talks into the night with Karli Christiansen, a friend who I made at the conference and instantly bonded with; a whole day walking around a very chilly San Francisco with Mette Furbo, a PhD student from Lancaster who just happened to be in San Francisco at the same time; and an 8 hours conversation I had with 'the man next to me on the plane' (he was called Ted Weatherford, was a Silicon Valley veteran, and turned out to be an expert in semi-conductors). On returning from California I knew it was decided: my PhD *would* address the future of Bitcoin.

³ Special thanks to all involved, including Alan Dix, Ben Griffin, Dee Hennessey, Gordon Blair, Graham Partridge, Karli Christiansen, Matthew Colledge, Maria Angela Ferrario, Shabana Khalid and Sam Lindley.

I arranged to meet with a couple of academics at Lancaster University to try and develop the concept from ‘do a PhD about the future of Bitcoin’ into something a bit more research-worthy. One of these meetings was with Professor Paul Coulton, who coincidentally had actually assessed my MRes project in the not-too-distant past, so had a little bit of a clue as to my style and interests. Paul asked what it was about Bitcoin that I was interested in, I replied “what impact it might have in the future”. Without skipping a beat Paul showed me some examples of Design Fiction films, which I immediately enjoyed and identified with⁴. Then he passed me a couple of papers to read, including Julian Bleecker’s essay on Design Fiction, which I took away with me to read over the Christmas holidays. Things were shaping up: I would research the future of Bitcoin, and the method I would use was Design Fiction.

It was then, in early 2014, as I began to read whatever literature I could find about Design Fiction, that I began to see that although there was obviously something enticing about the concept, nobody really seemed to know *quite* what it was (or at least were not able to articulate it simply). Bleecker’s essay is very compelling, but it doesn’t really have a specific point, rather it creates a ‘mood’. The actual purpose of the essay, and the mood it creates, was not clear to me. Tracing the coining of the term ‘Design Fiction’ back to Bruce Sterling revealed that *he* really just found the assemblage of the two words a useful way of describing the nuance of a ‘well thought through’ fiction. Although Dourish and Bell’s paper Resistance is Futile (which had been floating around the internet in draft form for a few years) was, in contrast to Bleecker’s paper, more familiar as an academic-type text, it wasn’t *really* about Design Fiction. So far, I was inspired, but was struggling to understand clearly what Design Fiction was and how I was supposed to ‘use’ this method to interrogate Bitcoin’s possible futures. There was no textbook to explain to me what this method was, or how to use it. I desperately wanted to use it because it seemed cool but was getting stuck at the first hurdle. Fairly quickly I encountered David Kirby’s book, Lab Coats in Hollywood, and the lack of concrete guidance continued. While it is undoubtable that there is a relationship between science fact and science fiction, in particular through Hollywood’s diegetic prototypes, this realisation was clearly just a *part of* some broader landscape. Nowhere in these texts could I find something concrete that I could confidently build a doctoral-standard research strategy around.

During these early explorations into Design Fiction, and at the height of my confusion about how I might apply it to do research, I became aware of a workshop called StoryStorm that was being held at an ACM conference called Designing Interactive Systems (DIS). One of the things that the organisers of the workshop were interested in was Design Fiction. I elected to develop an idea I had already had about Bitcoin, use it as the basis for creating a Design Fiction, submit it for consideration and apply to present it at the workshop. It was while crafting that particular Design Fiction, and still confused-but-enticed by the (lack of) Design Fiction literature, it became clear that I had an opportunity that

⁴ See Robot Readable World (<https://vimeo.com/36239715>) and Corner Convenience (<https://vimeo.com/92325970>) for example.

up until this point I had not properly considered: it occurred to me that perhaps I should be researching Design Fiction *itself*. That way the problem of lacking literature would be circumvented—instead of relying on pre-existing texts about how to use Design Fiction, I would write them myself. That is what I did, and, hence, this is *A Thesis About Design Fiction*.

1.3 Design Fiction and Cross-inter-post-and-trans Disciplinary Boundaries

This work was funded by and conducted at the HighWire Centre for Doctoral Training which nominally refers to itself as a ‘post disciplinary’ research centre. This self-proclaimed status, and how it manifested within the University’s structures, beguiled me for nearly a year when I first arrived. Eventually, energy resulting from the confused intrigue found an outlet via my Master’s thesis, a project I titled *Add Researchers and stir: observations on the challenges and opportunities of post disciplinary research* (Lindley, 2013). Among other criticism the work was labelled ‘self-indulgent’ by one of its examiners (this, purely coincidentally, was Professor Paul Coulton, who later came to supervise this PhD!) and its academic credentials are probably not befitting of doctoral research but setting aside the rigour that the argument was constructed with, I think the points it was trying to make were valid. The Master’s thesis built from the tension between academia’s traditional silos (which are strengthened and maintained by publishing cultures), and the realisation that huge value can be created when multiple silos interact and the boundaries between them are crossed (Blackwell *et al.*, 2010). To capitalise on this value is the very reason centres like HighWire exist, however after initially being dazzled by a lot of hopeful and positive rhetoric around post disciplinarity (the term itself is part of this optimistic buzz) I had come to lament the aspiration of the centre instead. Seeing through the optimism I had become disheartened by the realities of incompatible disciplinary lexicons, misgivings of mixing methodological stances, and incongruous epistemological dogmas—all of which are set against a background of academics’ tendency to be highly territorial. It seemed that post disciplinary research was a pipedream, an impossibility, the product of hype and branding rather than a means to capitalise on intellect, or foster innovation.

Months later, when I found myself using Design Fiction, I reflected back on my Masters to consider how Design Fiction might interplay with what I had called the “self-preserving giants” (Lindley, 2013) of academic disciplinarity. These giants were the conglomerate of the academy’s foundational disciplines, and their accompanying publication venues. What I began to realise, and what is of relevance for *this* thesis, is that Design Fiction—as with the design practice and design research per se—has interdisciplinary DNA. Furthermore, it is a cross-cutting enabler, and it’s something that may be *used* by any other discipline too. The interdisciplinarity necessary to do Design Fiction well should not be underestimated; to build a Design Fiction effectively one needs the ability to comprehend a technology’s properties (e.g. artificial intelligence, autonomous vehicles, GPS dog toys, etc). In other words, if one is using Design Fiction to prototype artificial intelligence, or brain-computer interfaces, then you need

disciplinary expertise that allows you to work with such technologies meaningfully. Furthermore, have the ability to *understand* those technologies, and how people interact with them in context is equally important. Domain specific technical knowledge may come by recruiting into a project somebody with the necessary expertise, or by doing ‘research for design’ (background research to support a project). But developing a meaningful understanding of context, of the ‘world’ that futuristic technologies might live within, is less straightforward. Various people have tried strategies to get into these potential worlds. For example Nova et al. used an ethnographic study methods to inform the creation of a Design Fiction (2012), elsewhere science fiction has been employed as source of inspiration (Wong, Van Wyk and Pierce, 2017), and theories more frequently used reflexively and analytically in Science and Technology Studies have been proposed as a means to steer the Design Fiction production process (Lindley, Coulton and Sturdee, 2017). The point here is that making Design Fiction is almost always the result of a conflation between soft and hard science as well as technical and social insights. All of this is also couched in the traditions of the Design discipline too, hence theories about design thinking, creativity models, design epistemologies, and so on, are all part of what contributes to the disciplinary make-up of Design Fiction. Clearly then, although there is no *specific* formulation of how Design Fiction is constructed from other disciplines. Whichever way you cut the cake, it *does* require a multi, cross, inter, trans, or possibly post disciplinary approach.

While it would arguably have been possible to produce a thesis that aligned the research with a single facet of a particular discipline (e.g. the title could have been ‘Using Research through Design to Develop Design Fiction Methods for Human-Computer Interaction Research’), given the post disciplinary remit of the HighWire centre *and* the inherently interdisciplinary subject, doing so would have felt like a dereliction of duty. Instead the thesis tries to make more general contributions that draw upon an array of disciplinary perspectives and makes a variety of domain-focused contributions. I was spurred on by the apparent benefit of forcing these interdisciplinary boundary-crossings; research into that area seems to show that tightly-focused work with a strong sense of disciplinary alignment can help to refine and tweak existing ideas, but more studies drawing on upon multiple disciplines can result in more radical outcomes that tend to forge entirely new ground.

“Whilst small innovations might optimise an existing structure or process, larger-scale innovations – scientific breakthroughs, or completely new business models – usually involve crossing organisational boundaries, creating new processes or defining new organisational structures.” (Blackwell *et al.*, 2010, p. 10)

The interdisciplinary aspiration is reflected in the thesis’s discussion of methodology. Specifically, an appreciation for messiness of the real world, the consequent messiness of methodology, and the resulting requirement to construct a method that has the ability to respond to and accommodate the mess. Consonantly the case studies are built to reflect the methods; each one has a significant amount of attention paid to establishing context and reporting the

results that are relevant to that context, as well as insights pertaining to Design Fiction itself.

In summary, and notwithstanding a certain amount of distain for the terminology itself, this doctorate is intentionally and overtly ‘post disciplinary’. It is Design research that contributes to Human-Computer Interaction (which itself is an aspect of Computer Science); meanwhile it is Computer Science research that participates in something Organisational Science might call Foresight Studies; it relies upon research from Media Studies, critiques arguments others have grounded in Critical Theory, and both hopes to contribute to, and draw upon, Science and Technology Studies; and so on, and so on, and so on. Keeping the competing pull of different disciplinary influences in balance with the work’s rigour and ambition is a substantive challenge. However, by acknowledging the challenge here, accommodating it in the thesis’s study of methodology, ensuring that each case study⁵ is presented sensitively, and being aware of the general ‘lack of discipline’ the aim is to balance these factors in a way that is fruitful and has appropriate academic rigour.

1.4 Thesis Structure

In the following paragraphs I give an overview of what the reader can expect from the chapters within the thesis.

1.4.1 Chapter 1: Introduction

The introduction is what you are reading!

1.4.2 Chapter 2: Literature Review

This chapter serves to situate the thesis’s contribution in relation to pre-existing work. A comprehensive literature review is what allows research to ‘Stand on the Shoulders of Giants’. However, deciding how to *structure* the literature review for this thesis, and figuring out what to include, was a challenge for several reasons which I list below.

First of all, I need to be sympathetic to my assertion that a core reason for embarking on a PhD that explores Design Fiction, in quite general terms, is because of a lack of literature about the subject. It’s worth noting that when I began this study, there was significantly less literature about Design Fiction. Here-and-now, in 2018, there is much, much more, however what remains is a lack of *consensus* within that literature—hence the kernel of what motivated my initial exploration is still there, even if the coordinates of that motivation have changed through the course of my studies.

⁵ For disambiguation see my note on my use of the term case study: 3.4.4 A note: by Case Studies I mean Studies of Cases.

Second, and with the first point taken as read, I could be so easily tempted into a vast, sprawling, yawning and expansive exploration of texts that discuss related-but-distinct antecedents and cousins of Design Fiction. As with any doctoral level investigation the ‘never-endingness’ of the potential rabbit holes one can enter is somewhat daunting. While some of these areas *are* indeed touched upon in the course of the thesis, the following rollcall of disciplinary labels and areas of investigation are intended to highlight the variety of topics which *could arguably* have a place in the literature review, but to avoid tangential excursions that don’t ultimately support my findings, are omitted: Italian futurism, radical design, adversarial design, critical design, *speculative* design—all of these could have a place. Similarly, I could have gone deeper through the design literature and into philosophy, perhaps trying to uncover what it is to be designer, the nature of creative thought, how all design builds the present and the future, and the nuanced relationship between fiction, design and ontology. Yet *another* approach would be to delve into sociologies of foresight, Human-Computer Interaction, everyday utopias, or academic commentaries on science fiction. Whether as a related and synergetic area of inquiry, as a direct inspiration, or as a means to rhetorically construct an argument, each of these areas *is* related to the research in my thesis, however, as is patently obvious from the breadth of the (not exhaustive) list of specialisms above—it would not be practicable to meaningfully review them *all* in my literature review.

Third, as will become clearer in the chapters that contain reflexive accounts of my practical explorations with Design Fiction (the chapter that form the empirical element of this research, see Case Studies, p. 65), each case actually requires its own standalone survey of literature from varying domains of study, and hence attempting to compress all of *that* literature into a comprehensive review in the introductory sections of the thesis would likely result in something monumentally inconvenient, laborious to read, and very unhelpful in terms of bootstrapping the thesis’s contribution to knowledge.

Fourth, because my thesis researches something which can be cast as a research method, the literature that provides the basis for the thesis’s methodological and epistemic standpoint somewhat overlaps with the more general literature around Design Fiction and research. Although this crossover exists, it in terms of readability it makes much more sense to provide a separation, so that the background to Design Fiction exists in the literature review, and the notes on knowledge construction are in the methodology chapter (What Is This ‘Research’ Thing Anyway?, p. 37).

With these four challenges in mind the content in the literature review is intended to be quite terse and serve a specific aim: to demonstrate a lack of consensus within Design Fiction literature (and thus to justify and situate this doctoral research).

1.4.3 Chapter 3: What Is This ‘Research’ Thing Anyway?

In this chapter I introduce my own strategies for dealing with the methodological practicalities and epistemological positioning of ‘Research through Design’ (RtD) in order to frame how I applied the method for researching Design Fiction. Conveniently, Bruce Sterling—the man who coined the term Design Fiction—wrote “the best way to understand the many difficulties of Design Fiction is to attempt to create one” (2014). That it was Sterling himself who quipped this line is nothing more than fittingly poetic coincidence, but it *is* the case that the same sentiment is integral to the thesis, and to its methodology. It also expedites a summary of my entire approach with fortuitous brevity. From the moment during my initial attempt to create a Design Fiction that I realised *perhaps this PhD could be about Design Fiction and not Bitcoin*, right through to my most recent engagements with Design Fiction, something that unifies the whole project is what I refer to as a ‘material engagement’ with Design Fiction, in this chapter this engagement is situated in epistemology, theory, and methodology.

After introducing RtD (which is a fascinating topic in its own right, in part because of how the concept—when applied in academic scenarios—beguiles positivist dogma but also, to some extent, *beguiles itself*) I explain my method; how the research was done practically. The following is quite deliberately a mouthful but gives a flavour of the entanglement of ideas that my methodology, in some way, needs to address:

This work describes the crafting of Design Fictions, each of which have been rigorously researched. Based on the research about the domain each Design Fiction is concerned with, along with research into Design Fiction itself, via the Research through Design process, research conducted through Design Fiction and the domain. The findings of this research then go on to inform the construction of new Design Fictions. The result is research into Design Fiction, through Designing the Design Fictions, and the Design Fictions involve the design of individual designs.

Building from Christopher Frayling’s wonderfully simple explanation of how art, design, and research interact with one another, the chapter acknowledges other perspectives on what RtD actually means, but ultimately returns to the simplicity of Frayling’s characterisation. As well as Frayling, Ramirez’s epistemology for RtD is adapted and the thesis is positioned in relation to postmodernism. As hinted at in the passage above this chapter attempts to deal with the self-referential nature and consequential entanglement of a project that uses RtD (which is a method, of sorts) to research Design Fiction (which is a method, of sorts). Ultimately the chapter provides an epistemology (of sorts) which in practical terms is a framework to disambiguate the words, phrases, processes, and conceptual structures that are used in the remainder of the thesis. In doing so the chapter describes *how* the Design Fictions recounted (in Case Studies, p. 65) construct my contribution to knowledge.

1.4.4 Chapter 4: Case Studies

While the first three chapters of the thesis provide some of the infrastructure to deliver the knowledge contained in the thesis, it is these case studies that are the payload. Throughout the whole programme of research which is summarised in this thesis, I have been mindful to consider how to represent my practice, reflexivity, and findings. These three factors are a tripartite whose effective dovetailing is of utmost importance and, in this particular research, at least, are intrinsically linked to each other in the same way that steam, ice and liquid water are: in some sense these constructs are all made of the same ‘matter’ yet they have drastically different properties. They may exist, stable and unchanging, in their own form (a reflection does not necessarily *have* to result from practice or transmute into a finding) but yet may also become part of a multifaceted, dynamic, and unpredictable process where one example of practice could be dramatically influenced by reflection on some other practical exploration, ultimately arriving at a finding, which one could not—even if one wished to—incorporate into a deeper layer of reflection.



Figure 2. Illustration by Miriam Sturdee originally created to support the arguments presented in *Implications for Adoption* (Lindley, Coulton and Sturdee, 2017). A caricature of Don Norman rides a ‘science bomb’ (inspired by Kong riding a nuke at the end of *Dr Strangelove*). The relevance here is a tangential link to case studies delivering an empirical ‘Payload’.

This potential for cyclical or complex relationships between practice, reflection and findings is, of course, a large part of the nuance and notability of my methodology chapter as it is central to the substantive debate around theory building in practice-based research, however it must be revisited to contextualise why the case studies have been presented as they have. To quickly reveal the dilemma faced: would it make more sense to begin with findings, and then reveal where they came from or to begin with practice and lead up to the

ultimately-resulting findings and insights? There is no perfect ‘solution’ to this, and hence I had to arrive at a compromise that balances the two—I elaborate on this in the introduction to the case studies.

1.4.5 Chapter 5. Contextualised Conclusions and Constructed Contributions

In this section I conclude the thesis. Each of the case studies already has some form of conclusion attached to it, however this section reframes those learnings and synthesises them so as to *contextualise* them within the scope of the whole doctorate. In doing so, and in line with the thesis’s constructionist alignment (see 3.3.3 Add a Crust of Constructionism, p. 47) by reflecting on the making of Design Fictions, some form of Design Fiction theory is proposed, offering direct responses to the fundamental research questions that this thesis aims to address. Although the findings presented *are* rigorously arrived-at and explored, an inherent part of how this knowledge is constructed insists on a certain amount of contingency—hence although the findings are concrete, we must accept that even concrete becomes weathered, and will decay over time. The same will be true of the thesis’s conclusions. Finally, this section contains some discussion of Design Fiction’s possible futures, and the role it may play for the academy.

2 Literature Review

2.1 Design Fiction's Shifting Landscape

Google's *Scholar* search engine, which indexes academic texts, reports 158 results on the search term "Design Fiction" for the 7 years from 2005 to 2012. The same query filtered for (at the time of writing) the 3 ½ years 2013 to 2017 returns 1120 results⁶. Of course, looking at these figures doesn't scientifically tell us anything at all, but nonetheless the figures give some sense that the time I became interested in Design Fiction and began my PhD in earnest was also a time when there was, comparatively, a small amount of literature related to Design Fiction. It's also true that in those 3 ½ years there has been a sharp uptick in the volume of things indexed by Scholar (mainly academic work) mentioning Design Fiction. Hence, to review the state of the literature at the time I embarked on this research, yields rather a different landscape to a representative review at the *end* of the process.

As I discussed briefly in the introduction, my original intent with this research was to understand the future of cryptographic currencies such as Bitcoin and to use Design Fiction as a research method to explore those possible futures. Alas, I felt that the depth of the Design Fiction literature was not sufficient to reliably or authoritatively build a methodology fit for a doctorate based on this literature. Hence my PhD pivoted, it became about the method. The 'gap' (in knowledge) I was aiming to fill was to do with using to Design Fiction in a research context. In order to get to that understanding I had to address some fundamentals: I wanted to know, what *is* Design Fiction? What can it *do*, and ultimately, what is the *best way* to do that? Such broad questions were necessary because Design Fiction is 'pre-paradigmatic'. I borrow the term pre-paradigmatic from Gaver's discussion of Research through Design (2012), who in turn borrowed concepts from Kuhn's famous text about paradigm shifts (1962). Gaver notes that until a paradigm is established research is defined by multiple competing points of view, usually drawing on different founding principles or philosophies. Individual researchers have to establish the basics of their rationale every time they make a contribution. While opposed and contentious views chafe against one another researchers must perpetually lay foundations, this makes progress slow. A paradigm emerges, or shifts, when an approach or theory that multiple stakeholders align with becomes the consensus. At this point researchers cease to be preoccupied with self-justification, their disciplinary existential angst dissipates, and in its place a general atmosphere of trust about methods and results emerges in peer groups and communities of practice. At this point the

⁶ By May 2018, when this text was last reviewed the number is up to 1,640.

rate of progress for a given discipline or field markedly increases as the pre-paradigmatic overhead is dissolved.

My relatively arbitrary Scholar query simply searched for the term “Design Fiction”. It cannot, in itself, discriminate between indexed entries which either *apply* or are *about* Design Fiction and those that simply mention it. With that in mind it’s worth noting that some portion of the results are included because they cite Dunne & Raby’s book *Speculative Everything: Design, Fiction, and Social Dreaming* (2013), which happens to have the terms design and fiction in its subtitle (although, as the comma in the subtitle confirms, they are not explicitly referring to Design Fiction). Hence, when the search term is “Design Fiction” the Google Scholar’s search algorithm returns papers which happen to cite Dunne & Raby, even though the citing paper may not actually have anything to do with Design Fiction. With that said, we can infer that by referencing that book, it’s *likely* the citing text has some interest or relevance to the broader speculative turn, of which the increased interest in Design Fiction is a part. Even when accepting the Dunne and Raby caveat, the uptick is still significant, and one might be tempted to believe that the expansion of texts which mention Design Fiction from 2013 to 2017 is attributable to a paradigm emerging, researchers committing to particular set of assumptions, and a specific approach gaining traction. This, however, is *not* the case, and will be demonstrated in the rest of this chapter. Design fiction is *still* pre-paradigmatic. By demonstrating the lack of clear Design Fiction paradigm, the remainder of this chapter legitimates and contextualises the broad, open-ended, and practical exploration into what Design Fiction really is that this thesis recounts.

2.2 A Brief History of Design Fiction

The precise provenance of the term Design Fiction is slightly unclear and while coinage of is usually attributed to Bruce Sterling in his 2005 book *Shaping Things*, Sterling himself said that it was Julian Bleecker who “invented the interesting term”⁷. In *Shaping Things* (a book about products, the environment, machines, and gizmos) Sterling uses Design Fiction in order to delineating between science fiction’s “hand-waving hocus-pocus” and a contrasting style of writing that, although dealing with fictional things (i.e. stuff that is made up), “makes more sense on the page” (2005) or, in other words, has been *designed*. The fact Sterling used the term in this way, along with his pedigree as a Steampunk author, underline the fact that Design Fiction *is* a relative of science fiction. However, I believe that Sterling’s original use of the term, and what Design Fiction has subsequently become mean that Design Fiction’s intents and

⁷ This quote is taken from a Wired article. Sterling, B., 2013. Patently untrue: fleshy defibrillators and synchronised baseball are changing the future. Available at: <http://www.wired.co.uk/magazine/archive/2013/10/play/patently-untrue> [Accessed March 3, 2014].

purposes tend to have a different quality to the more cultural and entertainment focus of literary or filmic science fiction. As Sterling put it, Design Fiction “sacrifices some sense of the miraculous, but it moves much closer to the glowing heat of technosocial conflict” (ibid). Those few sentences in *Shaping Things* seem almost certain to be the evolutionary antecedents of Design Fiction⁸, but, evolution is the operative term and what the practice is now has moved through and beyond what it was then.

After Sterling’s (arguably *laissez-faire*) coining of the term, the next significant marker is Julian Bleecker’s ironically titled *short* essay on Design Fiction (the PDF version of which is 97 pages long—albeit with quite a lot of images). Bleecker describes his view of Design Fiction both through the words on the page, but also via the space between them. First, it’s worth noting that although Bleecker has an academic background, this essay is not ‘academic’ (depending on how you define that). For instance, it is not peer reviewed (although it seems likely that in practice peers, colleagues and friends contributed). Neither is it published by a journal, within the proceedings of an academic conference, or even by an academic institution; rather it was self-published online⁹. Citations in the essay are diverse, and references to science fiction seem as relevant as academic ones.

“[The essay is] not meant to be an all-encompassing exposition. Instead I look at a few examples with some insights to go along with them. It is less a theoretical statement and more a travelogue of experiences.” (Bleecker, 2009, p. 15)

The effect though, is powerful. Extremely evocative, Bleecker’s essay is a masterpiece of rhetoric and also reflective of somebody who is clearly very smart *and* has something interesting to say. While it remains logical and coherent throughout, he seems to have taken care to write with a poetry which never tries to over specify what Design Fiction *is* but still provides a wealth of practical and sensible conceptual jumping off points for what it *could* be. All the while Bleecker inspires a feeling of concrete confidence that Design Fiction has ‘arrived’. Bleecker’s paper is but one step in a more elaborate sequence of events, which, together comprise this brief history of Design Fiction. Hence, I do not want to go too deep into the interior of the almost nebulous range of material that is covered. I will, however, include a few notes on *key* texts that he refers to and some pivotal themes.

⁸ I note that Blythe identified an earlier use of the term in 2003, but, this seems to be a separate and distinct evolutionary strand to the Sterlingian one, from what I can tell (Blythe, 2017, p. 5404).

⁹ It’s interesting to reflect on the merits of academic publishing traditions when looking at this paper. I muse around whether its freedom from the constraints which come hand-in-hand with academia’s “self-preserving giants” (cf. Lindley, 2013) is one of the key reasons why it has been so influential.

Bell & Dourish's paper "*Resistance is Futile*": *reading science fiction alongside ubiquitous computing* (2014) is of note because—as Bleecker describes it—it is a “gutsy” proposition. The gumption that these two influential researchers had was to write and publish a paper that compared and contrasted the “real” science of ubiquitous computing research with the “imaginary” worlds of science fiction. Their conclusion is that the two things are mutually beneficial. They argue that ‘good science fiction’ is acutely aware of science, much of the ‘good science’ is acutely aware of fiction. For the swashbuckling Bleecker, of course, they didn't go far enough. He believes that ubiquitous computing research *is* science fiction¹⁰. Bell & Dourish make it clear that they don't share Bleecker's extreme position, although whether they make that assertion because they *believe* it, or to avoid “ridicule and those nasty peer review notes” is not clear (2009). Bell & Dourish's paper, although relatively straightforward in its rhetorical structure, clearly plays an important role in Bleecker's formulation of Design Fiction. The following suggests that Bell & Dourish was *the* inspiration:

“I came to the conclusion that there was a practice there, just at the contours of their [Bell & Dourish's] essay that may as well be called ‘Design Fiction’” (Bleecker, 2009)

Where Bell & Dourish's contribution was an inspirational pivot-point around Bleecker's identification of Design Fiction as a potential practice, David Kirby's research into Hollywood's relationship with science provided a foundational construct that helps describe how one might start to make sense of the practice by understanding its constituent parts. Kirby's key contribution was the concept of the diegetic prototype. Bleecker's precis of diegetic prototypes goes thus:

“a kind of technoscientific prototyping activity knotted to science fiction film production [...] The prototype enlivens the narrative, moving the story forward while at the same time subtly working through the details of itself” (Bleecker, 2009).

Kirby's research, which mainly involved interviews with Hollywood insiders, as well as reflection on a wide array of cinematic examples, underpins Bleecker's position that fact follows fiction, fiction follows fact, and hence the two swap properties (Bleecker, 2009). In an array of filmic examples Kirby identifies how the portrayal of yet-to-be-realised technologies in (fictional) films can have a direct impact upon perceptions of how the real versions of those technologies are perceived when they arrive at a later time (i.e. fact follows

¹⁰ A position I identify with and that is reflected in a paper I co-authored, ‘Implications for Adoption’. The paper's argument is that much HCI/Ubicomp research shows novel technical implementations, these derive their value by leveraging the implicit assumption that one day they might be adopted. In other words, this assumption is a speculation. Given the centrality of this speculative element to HCI/Ubicomp research, then there is a strong argument for making the speculation *explicit*. The paper proposes HCI researchers routinely do that, and do so using Design Fiction (Lindley, Coulton and Sturdee, 2017).

fiction). In a compelling example relating to artificial hearts and the film *Threshold*, he suggests that the process by which fictional films alter reality rests on the fiction's ability to establish the necessity, normalcy, and viability of a given technology. Producing this effect necessitates a semblance of reality at the core of the otherwise *unreal* depictions of technology. As was the case with *Threshold* and a number of other examples Kirby cites, if a fictional technology is presented (within a given film's inner world, or diegesis) as necessary, normal and viable, then it may well have a demonstrable effect on *real* perceptions of that technology, encouraging people to see it as necessary, normal and viable in reality. In the cases Kirby identifies these effects emerge best through interdisciplinary collaboration among scientists, engineers, designers and film producers/directors in order to balance scientific fact, plausibility, believability and storytelling (Kirby, 2010).

Kirby calls these technologies that are not-really-real but do really-change-real-opinions, *diegetic prototypes*. 'Diegetic', from *diegesis*, is not a term in widespread use, but in the sense and context Kirby employs it, it's invocation makes a lot of sense. Film scholars contrast diegetic elements of the production—whether they be sounds, dialogue or visual elements—with their non-diegetic counterparts. Whilst diegetic elements are part of the world depicted in the film (i.e. the fictional otherworld where the story takes place), the non-diegetic elements are foreign to that world and, in practice, are usually added for dramatic effect. For example, in the opening sequences of the film *Saving Private Ryan*, an army advance up a heavily defended beach during the second world war. The sounds of engines, bullets, soldiers shouting, and wind are all 'real' insofar as they exist within the reality of the film. Hence those sounds are diegetic. However half way through the opening scene music is introduced. The soundtrack augments the blood and guts of the diegetic war scene, layering on top of it the unavoidable reflective melancholy of a sensitively deployed orchestral score. The sound is used in order to help tell the story evocatively, however, for our purposes that is not the point. What the point *is*, is that within the reality of the film there was *not* an orchestra on the beach; nor there a radio or gramophone on the beach playing back the music mechanically; nor, funnily enough, does music spontaneously erupt from the midst of bloody battles. It is a non-diegetic element of the film; it does *not* exist in the interior world of the film. Given that film and television are media that the majority are completely au fait with, most viewers rarely trouble themselves with distinguishing between diegetic and non-diegetic elements, or even being aware of the distinction¹¹. Returning to Kirby, however, the term *diegetic prototype* refers to blueprint technologies which appear within the internal reality of filmic worlds.

¹¹ With that said cannily hoodwinking audiences by merging diegetic and non-diegetic elements is a widely utilised directorial technique. For example, this clip of the Simpsons <https://www.youtube.com/watch?v=rz48peiGn5w> shows music we expect to be *non*-diegetic, is actually part of the world, and inversely Quentin Tarrantino's use of diegetic music where we might expect non-diegetic music, e.g. this clip from Jackie Brown <https://www.youtube.com/watch?v=vs9dhMZA7Uo>. Apparently Tarrantino *only ever* uses diegetic music in his films.

“Diegetic prototypes have a major rhetorical advantage even over true prototypes: in the fictional world – what film scholars refer to as the diegesis – these technologies exist as ‘real’ objects that function properly and which people actually use.” (Kirby, 2010)

Sterling’s first reference to Design Fiction in *Shaping Things* was in 2005. Bell & Dourish’s paper was released as a draft in 2007 (it was later published in 2014). Bleecker’s essay arrived in 2009, and while Kirby’s diegetic prototype research was not published until 2010, Kirby and Bleecker had clearly discussed the work prior to publication and it was referenced in Bleecker’s essay¹² (Sterling, 2005; Bleecker, 2009; Kirby, 2010; Bell and Dourish, 2014). Traces of how Bleecker’s vision for Design Fiction evolved are revealed in the acknowledgements at the end of the essay; clearly Bleecker’s thoughts were the product of many conversations and contemplations with a vast range of people. Notably Nicolas Nova, ‘co-conspirator’ at the Near Future Laboratory, a group whose practical explorations in Design Fiction have helped terraform the contours of Design Fiction’s landscape (even if that is a landscape which others don’t necessarily agree upon the shape of). The Near Future Laboratory’s work has been hugely influential on the development of the field. Beyond the reputations of the individuals in the group, who carry with them significant gravitas (in a whole host of different expert areas) much of this influence stems from the fact that Design Fiction, underneath all the theory, discussion and rhetoric, is a *practice*. It involves *doing stuff*. Hence, if one wants to understand it, then arguably an essential part of developing that understanding is to *do stuff* and also to look at the stuff others have done.

This brief history of Design Fiction, I think, is best wrapped up with two further anecdotes. First, in 2012 Bruce Sterling gave a brief interview with Torie Bosch, that was published on *slate.com*. In it, replying to the question, “So what is a Design Fiction?”, he said “It’s the deliberate use of diegetic prototypes to suspend disbelief about change.” Through citation, re-citation, and eventually subsisting without the need for citation at all (in the context of conversations and presentations about Design Fiction), this brief sentence became a de-facto definition of Design Fiction. Although poetic, snappy, and *accurate*, despite their pithiness Sterling’s words are ambiguous. Although this ambiguity (or lack of specificity, if you prefer to look at that way) is reduced when considering Sterling’s *full* answer to the question (as opposed to the widely quoted, but abridged version), the ripples resulting from Sterling’s words are still in evidence several years later. The long version of the quote is as follows:

“It’s the deliberate use of diegetic prototypes to suspend disbelief about change. That’s the best definition we’ve come up with. The important word there is diegetic. It means you’re thinking very

¹² I confirmed this in a conversation I had with David Kirby over lunch when I arranged for him to visit Lancaster University to hold a seminar on the content of his book, *Lab Coats in Hollywood*. He and Bleecker knew each other previously and had gotten to talking about his conception of diegetic prototypes in the same period that Bleecker was formulating the ideas that ultimately made it into the essay.

seriously about potential objects and services and trying to get people to concentrate on those rather than entire worlds or political trends or geopolitical strategies. It's not a kind of fiction. It's a kind of design. It tells worlds rather than stories." (Sterling, 2012)

So, in Sterling's view circa 2012, this is *the best definition we've come up with*—suggesting that he sees space for (perhaps expects) development, refinement and change. Additionally, he puts it quite clearly that in his view “It's not a kind of fiction. It's a kind of design. It tells worlds rather than stories”.

Finally, ‘*A Design Fiction Evening with the Near Future Laboratory*’ was a 2013 event hosted by IDEO. At that event, 4 years after his influential essay was published, Bleecker quips:

“I don't think we've figured it out [...] studying it, understanding it and trying to devise some of the principles - of what we're calling Design Fiction - is what we're trying to do.”

Between Sterling's widely cited, yet inherently ambiguous ‘definition’, and Bleecker's unabashed but insightful observation that *even he* hadn't precisely mapped the coordinates of what Design Fiction really is, at this point in time—the same time I first encountered Design Fiction—it seemed clear that while the general shape of Design Fiction was emerging through the mist, any notion of *precise* topography was conspicuously missing. Wanderers, hikers, explorers or other prospectors wishing to embark on a voyage on or around Design Fiction, based on this fogginess, should expect the unexpected on their travels.

2.3 The State of Design Fiction's Art

In the subsequent years—the same years during which the research documented in this thesis was conducted—Design Fiction has been widely adopted, and despite considerable efforts to ‘tame’ it, it remains something of a wild beast. During this time many scholars and practitioners have been inspired by the ideas Bleecker assembled in his essay and via interpretation have taken those nascent concepts in a range of different directions. The residue left behind from this profusion of heterogeneous approaches, perspectives, and interpretations of Design Fiction, is a raft of questions about the field. It is those questions existence which characterise why Design Fiction may legitimately be called ‘pre-paradigmatic’. In this section I review an indicative sample of those texts, each of which interpret and enact Design Fiction in a different way. This serves to underline the motivation for pursuing this doctoral thesis: that Design Fiction is pre-paradigmatic—and hence why exploring fundamental questions to address what it is, what it can do, and how it is best to achieve that—*should* make a meaningful contribution to knowledge.

Neither Design Fiction's roots, nor its reality (i.e. what people actually do when they call something Design Fiction), intrinsically align it to any particular academic discipline, and it has roused interest by researchers and scholars from diverse backgrounds (who have, in turn, interpreted it diversely and with their

own disciplinary-tinted-spectacles). It's also true that Design Fiction is not solely the preserve of the academy, and, arguably, it thrives best *outside* of academic contexts. Given that Design Fiction was incubated under the supervision of the (not overtly academic) Near Future Laboratory, then the practice's life and ability to prevail free from academic shackles intuitively makes sense. However, despite this, it *is* used and studied in academic contexts (such as this thesis!) and although Design Fiction pops up in multiple disciplinary ecosystems, Human-Computer Interaction (HCI) is the pre-eminent disciplinary¹³ home of academic Design Fiction (at least in terms of volume of peer-reviewed research, in high impact venues, that claims to use Design Fiction). The following sections draws upon a collection of literature which is representative of the diversity among how Design Fiction has been adapted and used by researchers. As I will show, there is a gamut of stances, and a conspicuous lack of accord.

2.3.1 Steampunk as Design Fiction (2012)

Other than Bleecker's essay, the most highly cited of all the, now abundant, research articles involving Design Fiction, is titled *Steampunk as Design Fiction* (Tanenbaum, Tanenbaum and Wakkary, 2012b). The authors—writing in 2011 (one assumes, given the publishing conference's review cycle)—note the juvenility of the field “the notion of Design Fiction is still taking shape in the discourse”. Notwithstanding this avowal, their treatment of Design Fiction I personally find to be somewhat intractable. Conveniently the combination of the paper's highly-cited position, the esteemed authors, and quite how inconsistent their invocation of Design Fiction is, supports the assertion that Design Fiction's fundamentals need to be better understood (i.e. the point of this thesis, hence why I begin this part of the literature review by citing this paper).

The core logic of the paper goes thus: the literary genre Steampunk, along with and Steampunk-derived making activities can be seen as part of an ongoing collective ‘Steampunky’ diegesis. This all-encompassing alternate Steampunk ‘reality’ has a rich vein of potential for ideation, and hence considering the fabric of a Universe where Steampunk objects, devices and societies make sense, may well be a useful or interesting thing for interaction designers to do. This sort of exploration and argument is common in design work emanating from the HCI discipline, and basically makes sense. *However*, there is a certain clumsiness in this paper which I think means that attempts to infer Design Fiction related learning from it are intrinsically constrained. At best they will bear precious little fruit, and at worst the paper's confusing rhetoric may be cited for contributing to Design Fiction's persisting pre-paradigmatic state. Although by no means alone, this particular paper is notable because it was published at

¹³ HCI's status is arguably not a ‘discipline’ but rather the work done by this community is that of an *inter-discipline*, i.e., a connector of other silo'd disciplinary thinking around technology that aims to catalyse innovation (Blackwell, 2015; Reeves, 2015; Lindley, Coulton and Sturdee, 2017). However, given that the thesis is not aimed at a specialist HCI audience, labouring this distinction is somewhat academic.

the famous and highly regarded Conference on Human Factors in Computing Systems ('CHI'), and, if one uses its citations as a guide, is highly influential among scholars that attempt to use Design Fiction in work published at CHI (which is arguably the most prestigious place to publish HCI research, and given HCI is the field which publishes the most Design Fiction-based research—we should pay attention to it!) A situation where a highly influential piece of research is *also*, in terms of its contribution to the field, somewhere on a spectrum between 'limited' and 'detrimental', is one worth thinking about. The paper's treatment of Design Fiction is, to use the words of a fellow post graduate researcher concerned with Design Fiction—Andy Darby— 'out of kilter' (i.e. disharmonious with itself). The following paragraph is intended to highlight the internal imbalance of the paper's Design Fiction rhetoric. My dissection is not, *at all*, intended to ridicule or be derisory, but rather to highlight the challenge of working with Design Fiction, a challenge that was considerably greater in 2011 when the amount of Design Fiction literature and practical examples—from which some sense can be deduced—was much less than it is now. The following examples highlight the dubious treatment of Design Fiction:

“Design fiction in Steampunk is a sustained envisioning that forms a narrative logic that governs the cultural values and meanings in which design is generated and imagined” (Tanenbaum, Tanenbaum and Wakkary, 2012b)

Above, Design Fiction is something that appears *within* Steampunk. It is an overarching concept which controls the story-world, and thus any 'designs' which emerge from the story-world. Meanwhile, it seems a paragraph later Steampunk *itself* is a Design Fiction:

“.. Design Fictions such as Steampunk explore alternate models of values and meanings” (ibid)

Later on, Design Fiction is described in terms of being a something which helps propel real-world subcultures including Steampunk:

“Design fictions actually help to propel the designs of Steampunk and other subcultures forward by setting cultural and social meaning as design goals” (ibid)

While I can identify with each of these ideas in isolation (and many more of the numerous other inferred purposes of Design Fiction in the paper) I find it hard to envisage a metaphor for Design Fiction as a field, movement or practice, where all of these things are *simultaneously* true. Although there is extensive rhetorical context behind these quotes even when in its verbatim format I don't feel enlightened as to how these various and diverse claims of Design Fiction might conceptually fit together as a whole. Even within the confines of this paper itself, there doesn't *appear* to be a stable platform from which a practically useful metaphor for Design Fiction can emerge.

However, casting an eye back to the extent of Design Fiction literature and practice in 2011 this paper does make sense. First it makes sense that the authors

would be playfully experimenting with different metaphors for Design Fiction, to try and understand its coordinates—to take a journey into Design Fiction *in spite* of the fog. Second, it's normal that with over half a decade's hindsight, some aspects of the paper's rhetoric no longer make sense! The point of note with this paper is not its underlying concept, as contrasting Steampunk and Design Fiction is an intriguing and insightful exercise, even if only an academic one. Neither do I take issue with the slightly indelicate way that Design Fiction, insofar as it is a 'thing', is cast in a multitude of different ways all at the same time. What is troubling about this paper, which holds fast today, is the relatively high number of citations it attracts. Given that many of its citations are made in order to support some claim about Design Fiction—oftentimes *definitional claims*—alongside the paper's reactive, whimsical, incongruous treatments of Design Fiction, it is obvious that arguments *built from* this paper will help concretise the pre-paradigmaticness of Design Fiction (or, put differently, prevent a paradigm from developing). If one were to anthropomorphise Design Fiction and imagine what it would be like to live a day in its life, then, based on interactions with this paper, it seems feasible to imagine it would be in the midst of existential anxiety, gripped by definitional dysphoria, and preoccupied by an overwhelming pressure to be everything to everyone, all of the time.

2.3.2 Anticipatory Ethnography: Design Fiction as an Input to Design Ethnography (2014)

In the midst of my early and exploratory Design Fiction research, in 2014, I watched the science fiction movie *Her*. In the weeks that followed, a series of discussions with colleagues Dhruv Sharma and Robert Potts led the three of us to embark on a piece of work which culminated in a research paper being presented at the Ethnographic Praxis in Industry Conference (EPIC) on a topic which we called *Anticipatory Ethnography* (Lindley, Sharma and Potts, 2014). This particular project is rather different to the majority of the other research in the thesis and would classify more—to borrow from Frayling's much fabled categorisations of design research (Frayling, 1993)—as research *into* Design Fiction rather than research *through* Design Fiction. Because this work is completely theoretical, and has no element of practice within it, I describe Anticipatory Ethnography in this chapter rather than in the case studies section of the thesis (however, in the case studies section there is an account *applying* this technique, see 4.3 An Ethnography of the Future). It may appear in opposition to normal protocol to include research conducted as part of the doctorate, within the *same* doctorate's literature review. However, I do feel the paper proposing Anticipatory Ethnography has a place in this literature review. One reason for this is that the Anticipatory Ethnography paper has attracted ample citations, suggesting some wider relevance or interest to Design Fiction practitioners, and as such, it is of relevance to this literature review.

The Anticipatory Ethnography argument involves casting design ethnography, as well as the design endeavour itself, as forward-looking processes which have the potential to develop a complementary synthesis. Further, design ethnography and Design Fiction have a deep appreciation of situated action (cf.

Suchman, 1987) at their core, and thus another commonality is revealed. Exploring the consonant means by which design ethnography and Design Fiction derive their value reveals the potential for a mutually beneficial symbiosis which is a product of their synergetic ‘forward-lookingness’ and inherent dependence on situativity. The resultant proposal, is that Design Fiction might provide an opportunity for ethnographers to extend the temporal scope of their research practice, addressing ethnography’s tendency to ‘privilege the status quo’ (Crabtree, Rouncefield and Tolmie, 2012, p. 170). *Design* ethnography, although agile in comparison to more traditional anthropological inquiries, has rarely found means to be entirely unshackled from the present moment in time. Meanwhile the sometimes-naive practice of Design Fiction could arguably benefit from the industrial gravitas of design ethnography by inheriting the rigorous and long-lived anthropological roots of ethnography, and perhaps most importantly from a well-developed methodological toolkit.

	Design Ethnography	Design Fiction	Anticipatory Ethnography
Temporal Dimension	Based on the present	Unrestrained	Inherited from design fiction
Source of Context	Situatedness	Diegesis	Diegetically situated
Ouputs	Actionable insights	Discursive space	Insight space
Methods	Well developed	Nascent	Proposed

Figure 3. Tabulated properties of Anticipatory Ethnography and its constituents.

From this starting point the paper develops several rhetorical arguments for why Design Fictions may be seen as reasonable sites to try and apply the data gathering and analysis techniques of design ethnography (Lindley, Sharma and Potts, 2014, p. 243). This is achieved by comparing, contrasting, and suggesting connections between various aspects of each practice. With the argumentation structure established for *why* this looks like a fruitful thing to do, the paper progresses to speculate about possible ways to actually *practice* Anticipatory Ethnography. These are referred to as ‘modes’.

Three modes were proposed: studying the *process* of creating a Design Fiction; studying how an audience *interacts* with or perceives a Design Fiction; studying the *content* of a Design Fiction. Any of these places may be a site from which (anticipatory) ethnographic data may arguably be gathered. In order to exemplify how each of these modes could work we invoked a concept I termed ‘incidental Design Fiction’ (see 2.3.3.4). These incidental Design Fictions share the properties of a Design Fiction, without actually *intending* to be one. Making the case for Anticipatory Ethnography the movie *Her* is referred to in this way in order to articulate how each of Anticipatory Ethnography’s modes might happen in practice.

To study the *process* of creating a Design Fiction one could either observe or interview producers, writers, set designers, and cinematographers, etc. Their experiences of crafting the diegeses of pieces such as *Her*, hypothetically, would provide a rich dataset relevant to the specific future contained in the film. The

concept appeared to be supported by quotes from Her's production staff, for example: "When something felt weird, when Joaquin was uncomfortable with something, I knew it meant there was some place I had cheated or hadn't thought through or hadn't gone deep enough. His flinch is always worth listening to." (Harris, 2013). The second mode, studying an *audience* interaction with a Design Fiction was inspired from the practice of audience ethnography (Pastina, 2005). There are a variety of techniques that could be employed, through from the simplicity of interviewing audience members after watching the movie, through to diary studies, generating scenarios, and accompanied viewing (Quirk *et al.*, 2008). The third mode proposed studying the *content* of a Design Fiction, and involves researchers directly engaging with the movie itself and attempting an ethnographic study of the diegesis. There was never any intention to be prescriptive about how would be the 'best' way to do Anticipatory Ethnography, however, in terms of accessibility ease, this final mode seemed intuitively to be the most practicable option of the three. Later I will describe the experience of doing 'An Ethnography of the Future' by putting this third mode of Anticipatory Ethnography into practice, as well as the production of Care for a Robot (see 4.5)—a project which, although not an example *of* Anticipatory Ethnography, was directly inspired *by* Anticipatory Ethnography.

In summary, the Anticipatory Ethnography thesis lays out an argument for using the ideals of Design Fiction as a way of looking, as a lens. It's about applying thinking derived from Design Fiction in order to frame and articulate why and how insights about the future may be developed.

2.3.3 Taxonomies, Toolboxes and Typologies, and 'The Like'

Here, I review a range of research that attempts to organise or Design Fiction to fundamental principles which, in some way, are generalisable. Hence, these approaches, attempt to do achieve the same as this thesis. However, despite the industry necessary to produce these works, and the utility of the insights they harbour, the ebbs and flows of fundamental questions and incongruous perspectives on Design Fiction persists. Notwithstanding these attempts to codify the practice, Design Fiction has remained pre-paradigmatic.

2.3.3.1 A Methods Toolbox

In their Paper 'Design Fiction: A Methods Toolbox for Design Research in a Complex World' Grand and Wiedmer suggest that Design Fiction *is* a methods toolbox. Specifically they see it as a new way of envisaging design research that is well-suited to bridging the space between design's interest in the possible and alternative, and contemporary interests in science as a constructive, or creative, endeavour (Grand and Wiedmer, 2010). The final words of the paper are thus:

".. [Design Fiction allows us to] open a new research field of design research, which at the same time leverages the unique qualities of design as a practice, and incorporates the quality criteria for productive and creative experimentation in scientific research."
(Grand and Wiedmer, 2010)

I agree with this! And I think it's one facet of how wonderfully flexible Design Fiction is. However, the concluding sentence alone does not characterise what the authors were trying to do with the paper, nor how they have reduced and morphed Design Fiction into a construct which, I do not think, has caught on in the way they intended or expected. Their motivation with the paper is to break through design research's definitional angst (at least when it is compared to 'scientific' research) and to argue that the two are, in fact, on a continuum with each other. Their point, which to my mind is best summed up by Frayling's examination of the stereotypical views of artist, engineer, designer, and scientist (Frayling, 1993), is a salient one. However, while the Grand and Wiedmer thesis has merit, it is somewhat dangerous in how it truncates Bleeckerian view of Design Fiction by cherry-picking little pieces out which serve the argument. The danger—in the context of *this* thesis—is that those wishing to use, study or critique Design Fiction may in turn take elements of Grand and Wiedmer's argument, without exploring the full extent of what it is founded upon. In doing this quite warped views of Design Fiction may emerge, for example perspectives that separate Design Fiction from any semblance of *doing* design, reducing it to an organising such as constructivism or post modernism. Although that is a fair thing to do (and is arguably what I and colleagues did with Anticipatory Ethnography) it doesn't fairly represent the scope of what Design Fiction is any more than a service design textbook can articulate the breadth of design's influence—from architecture to footwear.

2.3.3.2 A Taxonomy

In his introduction to a special issue of Digital Creativity that focused on Design Fiction, Hales' is sympathetic to how "enticing and provocative" Design Fiction is and acknowledges that it "remains elusive", in spite of this, he proposes a taxonomy (2013). *Unfortunately*, the taxonomy—provisional or not—is *so* philosophical that the gulf between the insights in the taxonomy, and the practicalities of *doing* Design Fiction, would likely be impassable for the majority. This of course makes sense, Hales' taxonomy is derived from Bruce Sterling's own musings, unfortunately, however, those musings were aimed at post graduate media philosophy students at the European Graduate School and hence were not ever intended for a general audience (Hales, 2013). As with Grand and Wiedmer's work, this is somewhat dangerous: on the face of it, a taxonomy derived from the teachings of the man who coined the term, should surely be a sensible way into a new and—as Hales puts it, 'elusive'—practice. But, no: other than identifying that Design Fiction is still emerging and that it has an inherent "multidimensionality", this taxonomy could easily hoodwink rushed practitioners who might either latch onto isolated soundbites which support their view, or alternatively attempt to build a coherent model of what Design Fiction is from the media-philosophy centric perspective alone. Of course, the frames that Hales explains *are* useful, but, the problem is the rhetorical impact of the word taxonomy; while the term implies a complete organisation of the concept, the *reality* is that this work simply unpacks one, somewhat blinkered, perspective (I am sympathetic, I've spent 5 years doing this doctorate, and as that time has gone on I've realised what a huge challenge completely organising Design Fiction taxonomically would be!)

2.3.3.3 The Poetics and The Typology

In their paper ‘The Poetics of Design Fiction’, Markussen and Knutz note that Design Fiction is open to “several different interpretations, ideologies and aims” and yet they *also* claim a “precise definition of Design Fiction” via an “integrative account of the methodological interconnection between poetics and design practice” (Markussen and Knutz, 2013). My initial reading of this text was that the authors were using the word ‘precise’ to be analogous to thorough, complete, or comprehensive. With the benefit of hindsight, I now see that the word that bothered me was not ‘precise’ but was ‘definition’. The paper goes on to explain Markussen and Knutz’s position, which revolves around poetics, or, “the discipline within literary theory and semiotics, which studies the verbal and compositional techniques of fictional world making in the literary work of art”. They tie insights from poetics to design praxis and propose that this can disambiguate Design Fiction’s different interpretations. In practice, however, their work actually introduces another interpretation, but given that their interpretation calls itself a definition, it once again could trap unsuspecting scholars who assume that this definition is the *only* definition. In addition, a specific criticism of the poetics-based Design Fiction approach is that it firmly aligns Design Fiction to literature. If we take Sterling’s widely quoted interview as something worth considering—the quote goes, “It’s not a kind of fiction. It’s a kind of design. It tells worlds rather than stories” (Sterling, 2012)—and if we assume that the ‘fiction’ Sterling refers to is the fiction that is synonymous with literature, then invoking a *literary* theory doesn’t seem to, in intrinsic terms, make much sense. In related work Knutz, Markussen and Christensen proposed a “Typology of Design Fiction”. It takes six case studies—none of which proactively refer to themselves as Design Fiction—and tabulates common features of them.

“Our typology is not in any way meant to be exhaustive, as the elaboration of its five basic criteria depends on only six case analyses, which are even limited to projects and interventions oriented towards urban space. However, what it lacks in terms of comprehension, it gains from the level of detail acquired in understanding the particularities of design fictions as an approach. This is an improvement compared to existing research literature.”
(Knutz, Markussen and Christensen, 2014)

Once again there seems to be an internal conflict within their claims. The definition of a typology is the classification of general types, yet in the description above, it is acknowledged that the types only pertain directly to the examples from which they’re derived. As they unabashedly point out, despite their typology being a completely bespoke tool, in comparison to existing literature “this is an improvement”.

Interestingly, in their poetics paper Markussen and Knutz’s refer to Grand and Wiedmer’s toolbox paper, and are seemingly not overly impressed with how useful the tools are:

“.. a so-called method toolbox for how design researchers can use Design Fiction in their research practice. However, as we will demonstrate Grand and Wiedmer’s toolbox is lacking conceptual clarity” (Markussen and Knutz, 2013)

Their main critique is that the ‘tools’ they identified in the toolbox were the same tools used by every designer. This is a fair criticism. However, according to *my* reading of Grand and Wiedmer, it’s clear they did not mean that the text be interpreted as a list of tools to be used for doing Design Fiction, but rather that Design Fiction could unify disparate sections of the design research community. This confusion seems to communicate precisely the kind of ‘heffalump trap’¹⁴ that inconsistent or incongruent readings of, and more importantly writings about, Design Fiction have resulted in.

2.3.3.4 ‘The Like’

The section header refers to the English language saying, ‘*and the like*’, which is synonymous with ‘and similar things’. In this final section I include, more succinctly than the previous sections, overviews of further examples of Design Fiction research which propose attempts and ways of trying to unify or generalise aspects of the practice. While the first tranche of examples was indicative of, and in some way responsible for, the ambiguity surrounding communications to do with Design Fiction, the work in this summary mostly comes in *response* to the ambiguity.

Three of these examples are published papers from the earlier part of my doctoral research. ‘A Pragmatics Framework for Design Fiction’ was published at the European Academy of Design Conference, 2015. In pragmatics—the branch of linguistics that focuses on the contextual dependency of meaning in language—it is accepted that theoretical definitions of words and language cannot explicitly and concretely encode the meanings of words and sentences: the ‘actual’ meaning of words is tied to the context of use and the prior knowledge of those involved in the communication. Appreciating that pragmatics is as applicable to Design Fiction as it is to language, I then propose three categories of Design Fiction in order disambiguate communicate about different aspects of Design Fiction practice. The primary distinction is between things which are *created as* Design Fictions (I call these ‘intentional Design Fictions’) and those which are *interpreted as* Design Fictions (I call these ‘incidental Design Fictions’). A third category describes things which look like Design Fiction, but are used as corporate vehicles rather than critical ones: I call these ‘vapour fictions’ (Lindley, 2015a). Of course, I accept that these categorisations are movable feasts, they seemed apt when originally proffered,

¹⁴ Derived from an imaginary creature in A.A. Milne’s Winnie the Pooh, the concept of a Heffalump-trap describes something intended to catch an antagonist out, but which ends up catching the trap setter out. cf. https://en.wikipedia.org/wiki/Heffalump#Cultural_impact. I and co-authors have subsequently used the term to describe the risks of over relying on Privacy by Design (Lindley, Coulton and Cooper, 2018).

and still seem to have some relevance now, but as with linguistic pragmatics if the usage changes then definitions may also change.

In my paper presented at the StoryStorm workshop¹⁵, which itself was part of the ACM Designing Interactive Systems Conference 2014, I described a three-layered model of Design Fiction. This is discussed in more detail in relation to the Design Fiction project which helped me develop the model (see Heating Britain's Homes, the Bitcoin Radiator, and the Ministry of Crypto Finance, p.68). Nonetheless given its relevance to this section of the literature review I include the following precis. The model's purpose is to break down any given Design Fiction into some constituent elements, the breakdown is intended to be useful generatively and analytically. These constituent elements I present in terms of a 'model', the model can be represented as a graph (Figure 14, p.81).

Along the X-axis is time, spanning from now to the future, and on the Y-axis is some notional representation of reality. The graph can represent anything between there here-and-now, which is 100% real, and the infinite future, which is 100% unreal. Appreciating this interplay, and mapping 'layers' within it that represent ideas used to help construct a Design Fiction into it (real elements, world building/story elements, and provocative elements), the model is intended to be an analytical and generative tool for Design Fiction practitioners (Lindley and Coulton, 2014).

'Back to the Future: 10 Years of Design Fiction' is a position paper that I co-authored and presented at the British HCI Conference in 2015. The paper reflects on several contemporaneous accounts of the difficulties in defining Design Fiction: Sterling's qualification that "[this is] the best definition we've come up with" (Sterling, 2012), Tanenbaum, Tanenbaum & Wakkary's note that "The studio theme of Design Fiction is a somewhat recent theoretical development" (Tanenbaum, Tanenbaum and Wakkary, 2012a), Markussen and Knutz's aforementioned observation about varying ideologies and aims (Markussen and Knutz, 2013); and finally "Its meaning has remained somewhat up for grabs within the research community" (Tanenbaum, 2014). Despite the commonly held belief that Design Fiction's existential position is not clear, the abridged version of Sterling's 'definition' is still around, hence in the paper we deconstruct that definition, then rebuilt it, with the aim of "disambiguate[ing] communications 'about Design Fiction' in order to strengthen applications 'of Design Fiction'." (Lindley and Coulton, 2015a). In part our motivation with the position is to critique researchers who dismissed the conceptual complexity of this new-and-unknown thing but continue to claim that their research findings are supported by it. We offered a new interpretation which was equally intended to inspire careful and critical uses of the term as well as being cardinal itself:

"So, a Design Fiction is (1) something that creates a story world, (2) has something being prototyped within that story world, (3) does

¹⁵ See the workshop proposal (Maxwell, Woods and Abbott, 2014); and website <https://sites.google.com/site/wearestorystorm/>

so in order to create a discursive space. Although this definition appears straightforward, complexity arrives when we consider what ‘something’ may be – and we believe it is this complexity that is circumvented in discourses that characterise Design Fiction as ‘up for grabs’ or ‘open to different interpretations’.” (Lindley and Coulton, 2015a)

This approach, reflecting the many possible types of ‘something’ is one example of a shift in how scholars approach Design Fiction. Rather than trying to contain it, more flexible standpoints have become commonplace. This specific view of Design Fiction has, including its flexibility, ‘caught on’ to a certain extent. However, as will be discussed further in the thesis’s conclusions (see 5.2 What is Design Fiction? p.140), on reflection the use of the prefix ‘story’ in ‘story world’ is problematic because it reinforces a widely held misconception that Design Fiction is, or should aspire to be, a type of storytelling with elements of plot and narrative at its core.

With an interest in literary and cultural theory it is perhaps not surprising that Mark Blythe, a significant contributor to Design Fiction discourse within the HCI field, interprets Design Fiction in literary terms. ‘Research Fiction: Storytelling, Plot and Design’ posits that ‘plot’, one of the fundamental storytelling machineries, is a ubiquitous phenomenon, existing in lab studies, journal publications and conference presentations. One playful example refers to when HCI researchers, accustomed to lab studies, first encountered the different kind of plot (resulting from ethnographic work) they found it “surprisingly useful” (Sommerville *et al.*, 1993 quoted in Blythe, 2017). For Blythe, plot is central in Design Fictions too. Blythe’s analysis aims to establish what the “basic plot” of a Design Fiction is by deconstructing examples in terms of Booker’s taxonomy of plots (2004). That taxonomy includes plot tropes such as ‘Overcoming the Monster’, ‘Rags to Riches’, ‘The Quest’, and ‘Voyage and Return’. Although Blythe takes quite a general view, that ‘most things’ have a plot, he pays particular attention to Design Fiction and whilst he does not claim that Design Fiction *is* plot, it is clear Blythe sees plot-like qualities in Design Fiction and believes that they are significant (2017). This position is an interesting one, as are many contrasting metaphorical ways to see the world, however it is perhaps an unavoidable product of Blythe’s position as a significant contributor to Design Fiction discourse (in HCI, at least) *combined with* Design Fiction’s state of academic flux, that this paper could likely be interpreted to mean that Design Fiction’s *must* have a plot—a claim that the findings presented later in this thesis dispute.

In related work Blythe and Encinas discuss what they call the ‘co-ordinates’ of Design Fiction, identifying ‘science, magic, ambiguity and irony’ as the “cardinal points of Design Fiction” (Blythe and Encinas, 2016). The paper builds by categorising various examples of Design Fiction. Although the piece is convincingly written, in some ways the argument is circular. Similarly to Knutz, Markussen and Christensen’s typology (2014), many of the examples cited to support the rhetoric of this piece were not *created as* Design Fiction, hence it is not clear whether they were chosen to fit a pre-existing hypothesis as

opposed to *generating* or supporting the hypothesis. Setting aside this potential epistemic flaw, to exemplify how Design Fictions created in the vision of the four coordinates may differ from one another, original Design Fiction examples are created and included around divorce for the over 60s demonstrating each of the previously identified ‘co-ordinates’. Finally, a map shows that the majority of Design Fictions, according to this categorisation are ‘scientific’, concluding that “there may be rich possibilities in the more or less undiscovered countries of Design Fiction” (Blythe and Encinas, 2016). As with Blythe’s research on plot (2017) this work does not explicitly say that it is definitional; it is not overtly attempting to define what Design Fiction is. However, as with the prior example this does deserve inclusion here because, indirectly, the claim to identify ‘The’ co-ordinates of Design Fiction could easily be construed or interpreted as a definitional statement or one that makes fundamental claim.

Alongside these rather introspective auto-interrogations of Design Fiction, Cameron Tonkinwise offers a fairly universal critique of not only Design Fiction, but a raft of related practices such as adversarial design, ludic design, speculative design and others. Taking *particular* exception to the “bubble that is HCI” he writes “Calling out all these specialist versions of designing benefits only the artificial ecosystems of academic design research” (Tonkinwise, 2015). The essence of Tonkinwise’s point is that designers should always be doing the things which constitute the assembled bunch of practices that he critiques (e.g. futures, fictions, speculations, criticisms, interrogations, probes, etc). Thus, if a designer ‘should’ be doing these things anyway, the provocation here is that any designer *not* doing these things is designing “inadequately”. For Tonkinwise “What designers make becomes the futures we inhabit” and hence, distinguishing these practices (Design Fiction, etc) “reinforces the mistaken belief that design is just an instrumental task—styling” (Tonkinwise, 2015). Although Tonkinwise’s laser-beam critique focuses on Design Fiction and its brethren, the targeting is a distraction from an underlying truth which consolidates to:

“For all the attention design gets these days, the material practices that are design’s essential focus are still not sufficiently acknowledged. What is really radical about design is that it, and it alone, can understand and so intervene in material practices. Any version of designing that misses that undermines design’s power.”
(Tonkinwise, 2015)

Insofar that ‘to design’ is a much more involved process than simply ‘having an idea’, I agree. I also agree that the material engagement designers go through, whether to learn how to build a user interface by experimenting with code or to understand aerodynamics by sketching, building, and testing, is a crucial element of how designers work. However, I do not agree that these qualities cannot be transferred to Design Fiction. Tonkinwise’s inclusion of Design Fiction in his broader critique reflects on ‘Designers Doing Fiction’, noting how useful it can be to situate the possible future that a design may result in among the imagined people that use it and the future world that enables it. The common conception that Design Fiction is only a writing practice, however, imbues, the

critique with an incompleteness that undermines it. Design fiction can do all the things that Tonkinwise says good design should do; however, it does it in a realm of unreality, in a heterotopia, and from another place. If the creation of a Design Fiction is the end of a process, and if that is to be classed as a worthy activity or not, really depends on what the intention is. As Tonkinwise points out, “Design makes futures. What designers make becomes the futures we inhabit”, hence if our intention is to *make a future*, then clearly the process cannot *finish* with a Design Fiction. However, if one’s intentions are less bold and more towards understanding the present, generating ideas, or developing deeper understanding of somebody else’s ‘preferred’ future, then the process may well finish with Design Fiction, and still be considered a success.

2.4 The Arts Around Design Fiction’s State

The title here is a playful call back to the earlier section titled ‘The State of Design Fiction’s Art’ (2.3, p. 21). The ‘play’ stems from the fact practices related to Design Fiction are oft very closely related to the arts, and, are less related to applied design practice (e.g. product design or graphic design). As opposed to the previous header, where ‘state’ was meant in temporal terms, here we can take ‘state’ to mean Design Fiction’s *territory*. Some of the most frequently name-checked practices that relate to Design Fiction are critical design and speculative design, and they *do* have many similarities. However, whilst critical and speculative design both appear to have a clear ‘genetic’ tie to work done at the Royal College of Art (RCA), Design Fiction actually has different DNA. If we continue this genetic metaphor, the RCA school and Design Fiction are best seen in terms of co-evolution, rather than shared parentage. However, Design Fiction is certainly *younger*. The distinction is mainly an academic issue—it has little practical relevance—but given the gravitas that the RCA-school commands it seems worth clearly articulating my position on it.

Before progressing to discuss other practices, first I quickly want to pay attention to how Anthony Dunne and Fiona Raby describe Design Fiction in *Speculative Everything*. Their assessment, in essence, paints Design Fiction as a corporate and video-based approach that sits within the broader gamut of the speculo-critical design work they introduce: “design fiction is increasingly being understood as a genre of future vision video (sometimes photos but rarely stand-alone objects) designed specifically for circulation on the Internet rather than in exhibitions” (Dunne and Raby, 2013, p. 100). This, frankly, isn’t representative of what Design Fiction really is any more. While there *is* a lot of shared ground between the corporately-motivated visioning videos—which I termed “vapour fictions” (Lindley, 2015a) and latterly “vapourworlds” (Coulton and Lindley, 2017b)—and Design Fiction ‘proper’, the vast majority of Design Fiction practice these days is not corporately motivated. Later, Dunne and Raby note “Margaret Atwood’s preference for the term *speculative literature* over *science fiction*” and their own preference for “*speculative design* over *design fiction*” (2013, p. 100), which seems to more appropriately get to the heart of the distinction. Rather than being about fundamentally different practice this about terminologies which denote territories.

Extending the speculative design's territory backwards, we might encroach onto critical design's landscape—which similarly is deeply rooted in teaching and practice emerging from the RCA. While others may have more nuanced distinctions between these branches of the family tree, it seems fair to resolve to temporality: where speculative design ends towards critiques of the future, critical design offers a critique of the now. Given that, oftentimes, critiques of the now quite naturally become potentials of the future, in many ways there is not real distinction between the two. In fact, the “sort of manifesto”, *A/B*, seems to seamlessly unite both critical and speculative variants (Raby and Dunne, 2009).

Looking beyond the last 25 years of the RCA, there are other practice which, in broader cultural terms, have some sort of relationship to Design Fiction and other speculative design movements. A full and detailed discussion of this is out of my scope, but for the sake of acknowledgement one might consider the evolutionary relationship between Italian futurism, leading into adversarial and radical design (e.g. Archigram and Super Studio). To trace how these movements, intersect with one another, and how they may have created the foundation of today's speculative movements is a job for an art historian, but what is blindingly obvious is that designers (and our cousins the artists) have, for a very long time, been fascinated by exploring futures, and oftentimes technological futures. While Design Fiction may be a new way of doing it, the *thing* it is trying to do is as old as the hills.

The approaches mentioned thus far have emerged from art and design schools, but there are other approaches too. *Foresight studies* (cf. Salo and Cuhls, 2003; van Lente, 2012) aims to anticipate the future, but rather than being couched in art and design is more grounded in sociology and management science. Potentially these disciplinary leanings may have some impact on the different types of insight the different approaches produce, but again, that is outside the scope of what this thesis offers. Other points of departure on this spectrum include *Horizon Scanning* and *Future Scaping*. Arguably user research methods such as Design Ethnography attempt a kind of futurology too—Noah Raford offers a neat mapping where a whole host of these practice sit in relation to three categories he sets up; ‘Foresight’, ‘Design’ and ‘Gonzo’ (2012).

Any of these related areas can probably cast a new light on Design Fiction, and yet if one were to try and conceptually hold *all* of these concepts in mind at the same time, the result would probably be a grey mush of meaninglessness. Hence, where I have been influenced by any external areas (including any of the aforementioned fields of study) then I make those citations explicit. For example, references to using Design Fiction to create a discursive space, its intention to use design to ask questions rather than provide answers, are speculative design tropes that I have drawn directly from Dunne and Raby (2013).

2.5 ‘Academic’ Means ‘Not of Practical Relevance’

The material of language is a wonderful thing, and, again, here my section title tries to be play with language’s material. While ‘academic’ can refer to multiple things, *here* I make reference to the dictionary definition of academic which refers to being ‘primarily theoretical’, which if we flip the logical operator arguably means ‘not of practical relevance’. I don’t mean to undermine the discussion above, but rather to illuminate the fact that it, alone, does not *holistically* tell the story of Design Fiction. To employ another analogy; words can be used to describe artworks—from Pink Floyd’s *Dark Side of the Moon* to the *Sistine Chapel*—and *something* is communicated, but such explanations may never be equitable with the phenomenological experience of ‘being with’ these works in the way they were intended to be experienced. My point is that, although in this chapter I have reviewed a range of texts which in varying degrees encompass the ‘rigor’ of the academy, the sum of these texts augmented with layers of critique atop them, will *never* be able to properly communicate the nuances and texture of Design Fiction. Design Fictions have properties that transcend a literature review, and one cannot measure Macaques in terms of Gibbons.

Alongside the difficulty of accounting a multi-modal and poly-media practice textually, it’s equally worthy to point out that Design Fiction thrives outside the sheltered reaches of the academic reef. Referring back to Tonkinwise’s critique of numerous speculative design practices he gloomily desponds “If it is in a gallery, it is art [...] If it is at an academic conference... I can’t finish this sentence. Despair.” (Tonkinwise, 2015). Although the sentiment is drawn from a fairly vehement critique of speculation, a subtext is that *design* (in whatever form it takes) is best communicated in the medium it was created, and in the context it was created for. As such, please remember that this discussion of Design Fiction *is academic*. *Arguably* it is of no *practical* relevance. If it does have practical relevance (and, as it happens, I in fact think it does) then to contextualise that relevance it should be considered in terms of the things it describes—the Design Fictions. My point here? If you are reading this, and—per chance—are not familiar with the spectrum of Design Fiction practice out there; *go and look at it*, else, this literature review probably carries little gravitas and is *purely* academic.

2.6 Summary

To recap the literature reviewed here. Through his essay, Julian Bleecker has done more than anyone else to codify what Design Fiction really is, but seemingly purposefully does *not* try to over specify it (perhaps realising that to do so would stifle it). The various citations and poetic assembly of arguments that he puts together are the substrate from which pretty much every Design Fiction endeavour since has built from, but, that matter is porous, and allows all kinds of thinking to seep through it. Exemplifying this flexibility and porousness, whether it is seen as a type of Steampunk (or a thing that appears *in* Steampunk) or a temporal-proxy for ethnographic observations—to give two

examples—a theme that recurs is Design Fiction’s ability to lay atop some other concept as a sense-making or conceptual lens. But, there is clearly more to Design Fiction, most easily exemplified by the fact that to restrict it to this conceptual lens model *entirely* neglects the fact it is also a making practice. Even highly cited examples of academic papers that utilise Design Fiction, or those that attempt to fit it into taxonomies or toolkits, struggle to find any common ground (and in some cases are overtly self-contradictory about what Design Fiction really is, or how one might use it). Potentially confusing any attempt to cut through all of this we must accept that there are a whole host of related practices (e.g. speculative design, radical design, foresight studies) that probably intersect with Design Fiction’s endeavour but have their own disciplinary caprices. Finally, but perhaps most critically, even if *using* Design Fiction doesn’t necessitate *making* Design Fiction (e.g. Anticipatory Ethnography), *somebody somewhere* must make the Design Fictions; at some level involves the physical act of *doing something*. This corporeal nature is extremely hard to summarise or deduct through an academic literature survey.

This grounding, and all of its contradictory and existentially opacity (vis-à-vis Design Fiction) is what gives rise to my broad research questions:

- *What is Design Fiction?*
- *What can you do with it?*
- *What is the best way to achieve that?*

In addition to contextualising these research questions, the same grounding extends below into my epistemological and methodological position; a position that responds to and is reflective of the material nature of Design Fiction.

3 What Is This ‘Research’ Thing Anyway?

3.1 Introduction

While considering the need for my thesis to formally address epistemology, ontology and methodology, somehow my mind wandered toward the (fictional) philosophical blockbuster *Who is this God person anyway*¹⁶. Appearing within the similarly satirical-but-enlightening Universe articulated by Douglas Adams in his *Hitchhikers Guide to the Galaxy*, the book was probably representative of Adams’ radical atheist beliefs, which in turn have some resonance to my position on the philosophy of knowledge. Titling this chapter in reference to Adams’ fictional tome also results in the thesis having a heading slightly more interesting than *Methodology*—that said, this *is* the methodology chapter and will ultimately provide both a practical guide to how I develop an original contribution to knowledge, and also explains the philosophical foundations. Returning to Douglas Adams for a moment, separately from Hitch Hikers, in a posthumously published collection of writings, Adams elaborates on his feelings regarding the existence of God:

“I don't accept the currently fashionable assertion that any view is automatically as worthy of respect as any equal and opposite view. My view is that the moon is made of rock. If someone says to me, "Well, you haven't been there, have you? You haven't seen it for yourself, so my view that it is made of Norwegian beaver cheese is equally valid" - then I can't even be bothered to argue. There is such a thing as the burden of proof, and in the case of god, as in the case of the composition of the moon, this has shifted radically. God used to be the best explanation we'd got, and we've now got vastly better ones. God is no longer an explanation of anything, but has instead become something that would itself need an insurmountable amount of explaining. So I don't think that being convinced that there is no god is as irrational or arrogant a point of view as belief that there is. I don't think the matter calls for even-handedness at all.”
(Adams, 2002, p. 97)

If one were to apply Adams’ position on God, and then use it to shed light on my position on the ontological and epistemological commitments that particular research methods take, then there would be some crossover. Just as Adams

¹⁶ cf. http://hitchhikers.wikia.com/wiki/Oolon_Colluphid

believes that—*quite obviously*—the moon is made of rock and that God does not exist, I believe that—again, *quite obviously*—the research in this thesis has resulted in the production of knowledge, in some form or other. But how do I *know*, and how do I refute naysayers—who in Adams’ example would have him fly to the moon to confirm first hand that it is *not*, in fact, made of Norwegian beaver cheese. Arriving at an argument for how one might *know* something is the purpose of epistemology and is a necessary building block of any rigorous research. The problem with discussions about epistemology, however, is that by having them, there is a chance of forgetting about or obscuring the actual thing you were originally trying to construct knowledge about in the first place!

To balance the need to acknowledge and engage with epistemology, but not to get too distracted with whether the moon is made of cheese or not, is the challenge this chapter seeks to address.

Unlike Adams and his views on the existence of God I *can* be bothered to argue—which is fortunate, given this is a doctoral thesis, and the burden is on me to do so. However, at the same time I firmly believe that it’s *quite obvious* the approaches I’ve used have at least some validity and don’t want an expedition into the depths of the underlying methodological foundation to distract from the core research questions about Design Fiction. Notwithstanding this introductory section, most of this chapter is a more academically focussed discussion, but before I get to the academic sandwich filler in my methodological sandwich, I want to reflect on a Christmas story from the early 1990s.

A friend of my family, a man named Gregory Desjardins came to stay at my family home for the Christmas period every year. In this particular year the Christmas gift he gave me was a build-it-yourself 1:600 scale Airfix model of a World War II ‘pocket battleship’, the Graf Spee¹⁷. I was around 8 years old, but I had plenty of experience of building Airfix models. However, my prior experience mainly came from building model *aircraft*; my bedroom was adorned with a range of aviation models; 1940s fighters including Spitfires, Hurricanes, Messerschmitt Bf 109s, through to Cold War bombers like the Avro Vulcan. As I usually did when I got any new toy—Airfix models included—I opened up the box of the Graf Spee model and immediately began messing around with the contents. With Airfix models the messing around procedure involved taking out the sheets of moulded plastic parts, popping those parts out of the frames, and trying to piece them together in order to visualise how the thing would eventually fit together. This particular model, the Graf Spee, was *far* more complex than the aeroplanes I was accustomed to building. The planes usually had 7 or 8 significant parts, which you could easily put together without using any of the polystyrene cement necessary to permanently bond the parts together. With the Graf Spee, however, because there were so many parts, I was

¹⁷ The Graff Spee is the subject of the 1956 film *Battle of the River Plate*, which recounts the true story of the Graf Spee’s commander ordering her to be scuttled (deliberately sunk) based upon *false* reports of an incoming overwhelming British naval force.

dumbfounded. *Not to worry*, I thought, I’ll use the instruction leaflet. Disastrously, when I returned to the box to look for the instructions, they were missing! (I believe they had been accidentally ‘tidied up’, i.e. thrown in the rubbish bin!) Fearing the model would never be built I panicked and got quite upset, but thankfully Greg came to my rescue.



Figure 4. Photo of Greg Desjardin, my early Research through Design tutor.

It was not an easy task, but by repeatedly experimenting with the hundreds of tiny plastic pieces, slowly-but-surely, we made progress understanding how the model worked. When pieces *appeared* to be in the right position we cemented them together, and the model took shape. We did make some mistakes along the way and pursued some ideas which turned out to be wrong, but that is to be expected when ‘building blind’ like this. Although there were a few leftover mystery components left over, before too long we had a finished model of a ship! I loved the model itself, yet in many ways Greg’s *real* gift to me was showing me it was possible to complete the complex model ship even without instructions. Perhaps inadvertently, he’d taught me a lesson in epistemology.

So, what is the relevance to my doctoral research’s methodology? Well first of all, it seems somewhat romantic to liken Design Fiction to a new favourite toy, but beyond the romance *that feeling* is actually a bona fide representation of my introduction to Design Fiction. Excited by a sense of fun and intrigue, all the

while keen to ‘pop out the parts’ and play, but, at the same time dumbfounded by the lack of a coherent instructional manual. The lack of instructions is the main point of the story. How does one understand a complex thing without the schematic? In my story, the answer is by engaging with the raw materials that made up the model. We managed to construct the model by unpacking every single part and experimenting with those pieces until we could see how each tiny component was meant to fit together. Or, to be more accurate, how it *could* fit together. The contrast between ‘mean to’ and ‘could’ is important when it comes to my epistemic standpoint. With my model ship there were some left over parts whose purpose we never figured out, which are arguably a cause for concern. However, given that the thing we finished looked like the Graf Spee, and looking like the thing it’s a representation of is pretty much the only measure of success for a toy model, we might infer that those leftover parts were *not* a significant thing to worry about. Allowing this uncertainty to exist, rejecting the temptation to search for a fundamental, objective, or reductionist truth, was an absolutely necessary thing to do, in order produce the knowledge necessary to get the model finished. If we had obsessed over a finding the one true solution to our problem, then the task of finding the ‘right’ place for the leftover parts would’ve curtailed our ability to actually come up with a *reasonable* solution, and to complete the model.

So, to recap my story, through a *material exploration* of the problem, we acquired knowledge. This particular knowledge was very specific, it was knowledge about ‘*how to construct 1:600 scale Airfix model of the Graf Spee*’. Arguably the whole process helped me discover some general knowledge too; the most obvious lesson-learned is that when building models not throwing away the instructions *is a good idea*. But, beyond that I had also learned some more general things. For instance, it is advisable to figure out what every single part (or as many as possible) is for before you start cementing them together, in order to reduce the risk of ‘incorrect gluing’. Most importantly I learned that it’s possible to learn how to arrive at a new understanding based on the combination of creativity and material exploration.

In the context of this research and thesis, the story is allegorical, and allegorically speaking, the model ship is equivalent to Design Fiction. The lost instructions are akin to the lack of a cohesive body of literature that explains clearly what Design Fiction is and how to use it. And, the experimentation I and Greg were forced to do in order to figure out how to put the model together (which produced both specific and more generalisable knowledge) is comparable to the Design Fiction practice—or material exploration—that, as is explained in this chapter and recounted in Case Studies, provides the empirical basis for this thesis.

While I find the notion of my entire methodological and epistemological commitments being made by way of my Graf Spee story an attractive proposition, such a colloquial treatment of my approach to knowledge production would, I fear, invite some suite pointed critique of the thesis (that would likely then have to be corrected). In a similar vein, I would have been grateful if there was a well-established onto-epistemic position that the research

in this thesis could align with succinctly, but such a convenience is not, regrettably, available. I can, without *too* much fear of academic reproach, say my approach is quite tightly aligned to pragmatism’s acceptance of a compromise between dogmatic and sceptical philosophies to provide a “welcome antidote to the stultifying over-concern with matters such as ontology and epistemology” (2011, pp. 28–30). Although the whole chapter is coloured by the pragmatist’s compromise-and-antidote-providing filter, in the remainder of the chapter I do take some time to formally address the my assembled commitments to epistemology, ontology and methodology. First, I take a glance at Research through Design, looking at the approach in general terms to explore what the relationship between ‘Research’ and ‘Design’ might be. Next, I consider Research through Design’s epistemology, framing it in terms of a constructionist position, which, I argue, is a product of the approach’s positioning within the broader postmodern movement. With these discussions tabled, I conclude the chapter by returning to Research through Design, to describe how the onto-epistemic foundations informed my method and process, and ultimately, how those formulate the thesis’s contribution to knowledge.

3.2 What Happened When Design Met Research?

Given this research thesis is somewhat based on the products of design practice, and it is attempting to contribute to a design-centric subject, the above question is quite pertinent! There is, of course, no straightforward answer to the question, though. However, among the *possible* answers to the question, one of them is communicated in the practices referred to as Research through Design (RtD), an evolving set of research practices which are frequently traced back to Sir Christopher Frayling’s infamous (1993) pamphlet¹⁸. RtD is, insofar as there is one specific foundation, the guiding methodological and epistemological framework that this thesis builds from, so in the following I provide a quick introduction to Frayling’s pamphlet. The first step in this exploration is to consider the possible meanings of the word research.

Looking at dictionary definitions of research, the most fundamental point to note is the contrast between Research (with a big ‘R’) and research (with a little ‘r’). While the former refers to the production of new knowledge (‘Researchers at CERN discovered the Higgs particle’), the latter refers to a search for, and collation of, pre-existing knowledge (‘I have done some research and there do not appear to be any free hotels in Geneva tonight’). The little ‘r’ variant dates back several hundred years whilst the big ‘R’ type emerged more recently in the late 19th or early 20th century as the profession ‘Researcher’ developed in the worlds of chemistry, physics, architecture and the social sciences.

Building from the basic etymology of the words, Frayling points out how the characteristics inherent within the prevailing stereotypical views of artists, designers and scientists are relevant too. Stereotypically speaking, ‘the artist’

¹⁸ As an incidental observation, Fraying’s pamphlet gave equal weight to *art* as well as design, however in modern discourses the art element is often neglected.

borders on madness, is impetuous and rejects rationality; phrases such as the ‘artistic temperament’ are reflections of these stereotypes in the English vernacular. Insofar as the stereotypical designer, first we can consider the “pipe smoking boffins” who do practical, hands-on, experimentation in the sheds and workshops of yesteryear, and more recently the contemporary view of a “solitary style warrior” confidently quipping on a bus “let’s be philosophical about this, don’t give it a second thought”. Now, what about scientists? Well research scientists, are, stereotypically speaking, orderly individuals. They work to hypotheses, disregarding their own subjectivities with ease and systematically working towards critical rationalist conclusions. This somewhat demure representation goes away if we consider *fictional* scientists though, Frankenstein, Jekyll, Strangelove, and Emmett Brown—these guys are obsessives, lunatics, and in the case of Brown have implausibly wacky hair. The point Frayling is drawing attention to by highlighting these perspectives is that these stereotypes belie the realities of *practice*, “Research is a practice, writing is a practice, doing science is a practice, doing design is a practice, making art is a practice”. Considering the practical aspects of each endeavour reveals that the stereotypes are incomplete, and there is, in fact, a huge amount of crossover. What’s more, oftentimes the practice of ‘doing science’ absolutely needs some of the creativity more commonly ascribed to the irrational artist; the artists endeavour may well embrace both the grandiose visions of lunatic-fictional-scientists and the shed-based ‘boffinry’ of a 1960s designer. If we look at the whole gamut of what artists, designers, scientists and practitioners do, there “is a lot of common ground”, and on the fringes of that common ground *research* often comes into play. In fact, it’s hard to find an example of design, art or science which doesn’t depend on some (lower case ‘r’) research. However, the same doesn’t follow for the upper-case variety, which, while rarer, still frequently intersects with practice. Frayling draws on various examples to demonstrate that artists work in both cognitive *and* expressive idoms. Hence while some art constitutes upper-case ‘R’ research—a point articulated beautifully in this John Constable quote “may not landscape be considered a branch of natural philosophy, of which pictures are but experiments”—not *all* art can be cast as Research. Perhaps the most famous facet of Frayling’s pamphlet is his codification (which is derived from Herbert Read) of different types of intersection between art, design and research. It is here he specifies research *into*, *for*, and *through* art and design. For the sake of brevity, I’m going to drop the reference to art and employ the contracted form which concludes with the word *design* alone.

Research into Design (RiD) represents the pursuit of new knowledge about design, hence seminal texts such as Herbert Simon’s *Sciences of the Artificial* (Simon, 1969) or Nigel Cross’s *Design Thinking* (Cross, 2011) are products of RiD endeavours. The methods employed by RiD projects are non-specific; these projects could be some desk-based affairs that synthesise or review other research, or could employ other methods such as ethnography, grounded theory, or otherwise, in order to develop new knowledge about design. With RiD, it’s notable that design practice *itself* is being studied as a standalone thing. Hence, there are no intrinsic reasons why design *practice* needs to be involved in an RiD endeavour (other than to observe the products of practice).

Chapter 3: What Is This ‘Research’ Thing Anyway?

Research for Design (RfD) refers to research with a little ‘r’, hence the use of the word research here refers to a contextual search for information. This sort of research is usually done to support some other design-based process. This can manifest itself in no-end of different ways. An architect commissioned to design a road bridge may well do a significant amount of RfD in order to understand how many cars the bridge might be expected to carry, the details of any local bylaws governing bridge traffic, or the need for specific features such as suicide prevention netting. In the Design Fiction project *A Digital Tomorrow* (Nova and Kwon, 2012) an ethnographic RfD project supported the production of the Design Fiction by studying the ‘Curious Rituals’ people perform with their technology (Nova *et al.*, 2012). Once again there is no particular method for doing RfD, however in contrast to RiD, these endeavours *always* have something to do with design practice because they are being done specifically to support a design outcome.

Research through Design (RtD), like RiD, refers to the big ‘R’ type of research. Hence, it produces entirely new knowledge. *However*, unlike RiD, there *is* a specific method, and that is based on (design) practice. My introductory story, about building the Graf Spee without the instructions, is intended to be an allegory for RtD. In his 25-year-old pamphlet, Frayling notes that it isn’t always straightforward to understand, pre-empt, or plan where or when RtD is happening, but he does give some examples. First, he refers to materials research—through the creation of art and design artefacts exploring what particular materials can do. Frayling refers to an example project looking at the colouration of metals. A contemporary counterpoint is the artist Anish Kapoor being commissioned to explore *VantaBlack* (or, the ‘blackest thing in the Universe apart from blackholes’) by its inventor, *NanoSystem*. By commissioning Kapoor to create artworks using their pigment, NanoSystem hope to learn more about its fundamental properties and therefore, it’s possible uses. The collaboration is an attempt to do RtD (well, to be more specific, Research through Art).

One way of distinguishing these distinct-but-related practices from each other is to say that RiD and RfD are specific endeavours (to understand design, and to support the creation of a design) and are methodology agnostic. Meanwhile, an RtD endeavour could be exploring *anything* but has a more specific methodology; design practice *is* the methodology (accepting of course that ‘design practice’ encompasses a *vast* array of possible creative activities).

In summary, when constructing an argument for how art and design practice can produce knowledge and therefore be an act of *Research*, it is crucial to remember various factors. First, remember the lessons learned from the stereotypes: scientific explorations strive to produce knowledge; knowledge production is the outcome of research; science often requires creative thought; creative thought is often the modus operandi of designers; design, science, and research may therefore all be represented within a single gamut of ‘practice’. The upshot is that it’s possible to do scientific research, through design. Next, don’t forget that the two variants of ‘research’ will almost certainly interact. That is to say somebody doing RtD will definitely do some RfD, or, before designing

something it's likely that some kind of investigation into the detail of the context will be done first. Last, the way in which the RtD is conducted, and the type of RfD that is done, is very likely to depend on some prior understanding, which is almost certainly derived from somebody else's RiD endeavour! These interactions, and their many possible permutations are illustrated in the diagram below.

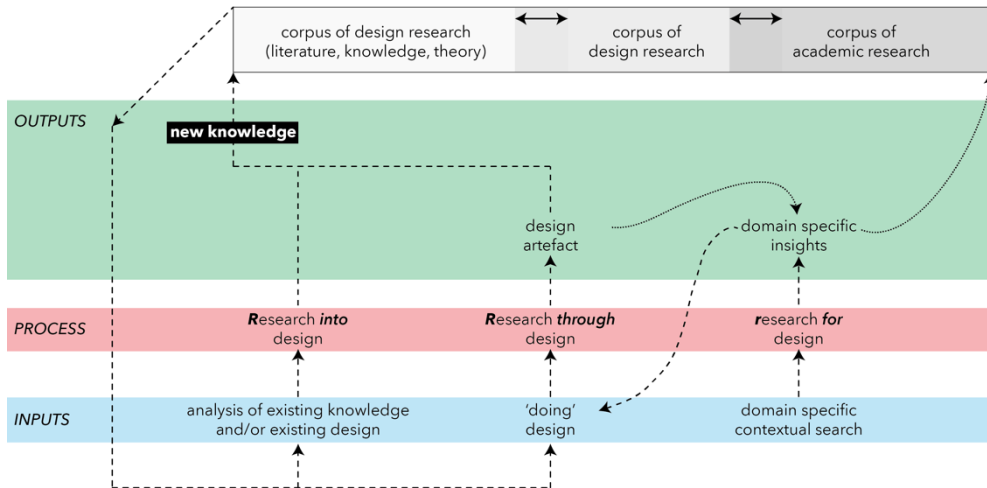


Figure 5. Diagram showing interactions between ‘design’ and ‘research’.

All the original contributions that I make in this thesis, and the processes which supported them, are represented by the possible flows in this diagram (which may also be adapted so that each occurrence of design is actually, *Design Fiction*¹⁹). Before progressing it's always worth noting that, despite the explication of relevant epistemology below, the way in which I approached my research is probably best summed up by the way I approached the building of the Graf Spee without instructions (3.1). However, in order to explore and attend to my onto-epistemic commitments in more highfalutin academic terms, I elaborate in the following.

3.3 Serving Up a Postmodern Assiette de RtD Épistémologie

Here I breakdown a view on RtD's epistemology in order to develop the pragmatic framework which the research in the rest of this thesis pivots around. I begin by dissecting Ramirez's epistemology for RtD, which although not a universally adopted position, is a coherent, self-contained, and practical assemblage of ideas involving a postmodern interpretation of grounded theory and Action Research, situated within a Constructionist framework (Ramirez, 2009). Using the structure of Ramirez's argument as a guide, below I discuss each of the ingredients that come together to assemble construct this particular

¹⁹ In fact I created this diagram to explain *Design Fiction's* relationship to RtD, RiD, RfD in a paper presented at the European Academy of Design Conference *A Pragmatics Framework for Design Fiction* (Lindley, 2015a).

RtD recipe. Once the raw ingredients (for no particular reason I am using a gastronomical metaphor in the following section headers, and we will slowly construct a pie of RtD’s epistemology) are introduced I explore a few additional perspectives on RtD before summing up how my approach relates, and what its underlying logics and motivations are.

3.3.1 Begin with a Roux of Postmodernism

Postmodernism isn’t really definable, to define it would involve a firm definition, and that would—ironically—be precisely the kind of thing that postmodernism opposes. Notwithstanding this paradox, the generally accepted terms of the postmodern turn involve breaking up of modernism’s grandiose projects such as ‘science’ or ‘progress’; “These narratives are fragmenting into a disorderly array of little, local stories and struggles, with their own, irreconcilable truths” (Maclure, 1995, p. 106). Summing up postmodernism’s incredulity with metanarratives, Lyotard refers to chaos theory; while the pursuit of *truth* about how the Universe really functions, down to tiny levels of detail, has long been the quarry of particle physicists, our progress has reached the point that we’ve realised as our ability to measure things accurately goes *up* so does uncertainty about the accuracy of the measurement (Lyotard, 1984, pp. 55–57). Alternatively, but also drawing on ideas derived from physics, we might acknowledge the observer effect; that the act of observing a phenomenon alters the very same phenomenon. Postmodern thinking pervades our view of the world and is an uneasy bed-fellow with the now-fragmented spirit of modernism. So, the postmodern lens, in contrast to a modernist one that would have us believe progress will be achieved through science, may colour the view to an extent that there is *no* reasonable basis upon which such ‘scientific’ claims could *ever* be true (Robson, 2011, p. 16). Similarly, there are extreme representatives in the other camp too; a staunch positivist, allying with the purest spirit of modernism, will refute any claim that isn’t verifiable in positivistic terms, and thus closing themselves off from the immense wealth of insights developed by the social sciences. Meanwhile a steadfast postmodernist may well reject the natural sciences and proceed to claim that there is no way to defend one account or conjecture over another. Neither of the extreme positions seem particularly useful in terms of arriving at practicable strategies for producing knowledge. Hence, while embracing the essence of postmodernism, the pragmatic position—one that I adopt—accepts that there *are* specific, personal, and community ways that ‘truth’ can manifest and as such provides a pathway to doing meaningful research (Kvale, 1995). Lyotard puts it thus; “any consensus on the rules defining a game and the ‘moves’ playable within it must be local, in other words, agreed upon by its present players and subject to eventual cancellation” (Lyotard, 1984, p. 66). Arguably embodying the same contingent construction of temporal rule-sets that his book explicates, Lyotard ultimately admitted that his knowledge of the science his arguments were based on, was extremely limited—an appropriately postmodern manoeuvre, resulting in the book, which is nonetheless influential, almost becoming a parody of itself (Anderson, 1998, pp. 25–27). Of most other movements this self-undermining quality might be detrimental, however the self-referential and disruptive spirit of Lyotard’s bullish rhetoric is arguably reflection of the postmodern message,

and hence is befitting. This is the same spirit with which I refer to the postmodern foundation of this thesis's epistemology and the manner in which postmodernism colours the research approach I adopt. The 'Roux' in the pie is a mixture of fat and flour, it's the basis for the sauce—this seems an apt allegory for the role postmodernism plays in this research's methodology; not the main event, but nonetheless bringing the whole dish together and uniting the flavours of the different elements.

3.3.2 Layer Slices of Constructivism

Beneath the shade of postmodernism's umbrella, Ramierz's epistemology for RtD is couched in Constructivism too. There is something of a terminological quagmire here, particularly because Constructivism (with a 'tiv') and Constructionism (with a 'tion') are often used interchangeably. That already confusing position is confounded by the fact that both terms represent theories of *learning*, as well ontologies, *and* epistemologies. Even *further* muddying the waters are the 'social' variants (i.e. 'Social Constructivism') that are derivative, but have subtly different connotations (Yilmaz, 2008, p. 163). With these potential points of confusion noted, let's proceed. I'll deal with the V-type first; Constructivism.

It's useful to remember to take discussions of Constructivism with a pinch of salt, because it's "not a single or unified theory; rather it is characterized by plurality and multiple perspectives" (Yilmaz, 2008, p. 163). However, what *does* unify Constructivist perspectives is the belief humans make meaning—relying on cognitively-developed *constructs*—from the interaction between their experience, and ideas; "It starts from the assumption that knowledge, no matter how it be defined, is in the heads of persons, and that the thinking subject has no alternative but to construct what he or she knows on the basis of his or her own experience" (Von Glasersfeld, 1995, p. 18). This means that Constructivism is completely, epistemologically speaking, incompatible with Positivism, because Positivists adopt the view that knowledge takes the form of universal laws, that these laws are a product of empirically-informed causality, and that through these laws we can objectively produce *facts* that are *independent* of the ideas inside any person's head. The Constructivist view, however, is that there are multiple *possible* realities—perhaps, there are as many variants on reality as there are people who ask, *what is reality?*—and none of these realities are *directly* accessible (Robson, 2011). Although here I am mainly concerned with the epistemology called Constructivism, the theory of education (from which the epistemology is derived) builds from the same kernel. As opposed to an *Instructionist* approach where students are *told* what they should learn by their teacher, Constructivist educators learn *with* their students; metaphorically speaking if the education process is a bus, then student and teacher are both passengers on it, and at the outset neither can be *sure* of the destination (Yilmaz, 2008). When Koskinen et al bring up Constructivism in their overview of practice led design research, they qualify what they call *Constructive Research*; "It should be obvious that we talk about construction, not constructivism, as is done in philosophy and the social sciences" (Koskinen

et al., 2011), however such a division is not so clear cut for Ramirez, a point exemplified by considering *Constructionism*.

3.3.3 Add a Crust of Constructionism

The spaces between two sovereign nations, where border control officers reside, is referred to as *no man’s land*—as these transient spaces are home to no person²⁰. The space between Constructivism and Constructionism is the antithesis of no man’s land’s and the relationship between them is more akin to the individual areas which ultimately ended up as the Swiss Confederation; each with their own identity, but ‘confederated’ with some semblance of common ideals. The point of the analogy is to highlight that the two approaches are so similar, the words are often used interchangeably and “the terminology is far from consistent” (Crotty, 1998, p. 57). The expanse of shared space between these two schools of thought is not surprising if we trace their histories: Seymour Papert (who also founded the MIT Media Lab) was central to the development of Constructionism, and by no small coincidence had previously worked closely with Jean Piaget (the person behind Constructivism). Ackermann describes the differences between the two perspectives in terms of similar goals, but with contrasting means. While Piaget’s thinking is more about internal cognitive structures, Papert’s emphasis involves “diving into” situations and making a more tangible engagement with the problem (Ackermann, 2001, p. 8). Of course, what constitutes such an engagement depends on the context and can differ drastically. In education, a Constructivist approach might involve providing a set of examples—of a mathematical problem, for instance—for students to consider, and then allowing them time and space to determine their own conclusions based on those examples. Significantly, all of this happens cognitively. In contrast, a Constructionist may encourage a tangible engagement with the problem; one that happens in the physical world, and that, one way or another, forces the students to *construct* (i.e. build) the relevant *constructs* (i.e. ideas). The duplicate meanings of the word construct, then, describe how Constructionism is a play on words that occupies a liminal space where the making of things produces theories. If we recast our gaze to be that of a researcher, as opposed to an educator, then Constructionism’s liminality makes sense: by doing Design one can produce knowledge, and in doing so, do Research.

This epistemology for RtD relies on Constructivism’s underlying rejection of the positivist belief in any objective reality which exists independent of any individual’s cognitive scheme. It then combines *that* rejection of positivism with Constructionism’s equivalent stance, which is differentiated by its penchant for direct-and-tangible, *physical*, engagement with the problem. This direct-and-tangible engagement manifests, in RtD, as the design process; including ideation, iteration and construction.

²⁰ Clearly this is not literally true—during the 2017/2018 humanitarian crisis involving hundreds of thousands of Rohingya flee Myanmar for Bangladesh, it is claimed 400 babies were born in *no man’s land* (<http://www.theindependentbd.com/post/114496>)—notwithstanding this reality, the analogy of no man’s land still works!

3.3.4 Season Liberally with Research Methods

Constructionism's dependency on the relationship between knowledge construction and practical engagement bears some resemblance to Action Research. Accepting the sort of "non-linearity" that postmodern theorists might promote, Action Research places direct engagement with the stakeholders (of whatever situation is being researched) front-and-centre. Realising this similarity but striving towards a blueprint for research design that unifies postmodernism, Constructionism, and previously established methodologies, Ramirez looks to a type of Grounded Theory called Situation Analysis (Clarke, 2005). I note that while for some Action Research may well be considered a research methodology in its own right, for Ramirez he sees it more as a guiding principle for how to organise the activities of an RtD research project, and looks to Situation Analysis to be the heavy-lifting equipment of knowledge production (Ramirez, 2009, pp. 8–10). Situational Analysis is very much a postmodern and Constructivist approach to doing Grounded Theory. In contrast to more traditional views that are coloured by Positivist outlooks, Situational Analysis embraces local construction of meaning, multiplicity of valid perspectives, accepts ambiguity, and ultimately frames the situation of inquiry itself as the most significant unit of analysis (Clarke, 2005, p. 32 and 205). Purposefully incorporating aspects of research methodology, alongside the theoretical and epistemological positioning, neatly rounds up Ramirez's proposition provides practitioners or researchers who wish to use RtD with clear idea of how they might actually *do* an RtD project.

3.3.5 Tasting the RtD Pie

The Ramirez approach to constructing an epistemology for RtD is a self-contained, succinct, and coherent assemblage. Particularly for anyone harbouring an anxiety relating to whether their design practice (or *Design Fiction* practice) might be the basis for making a substantive contribution to knowledge (this category of person includes *me*, as well as some researchers publishing design-based research in culturally-positivistic disciplines, e.g. Human-Computer Interaction) this pie of RtD epistemology appears to be constructed from tasty, fresh ingredients and assembled by a competent chef. In the chorus of its constituent parts, this epistemological pie is the cornerstone of the tastiest banquet, to which all harbingers of RtD are invited. But this allegory negates the impact of the inevitable cornucopia of special dietary requirements which arise in real world situations. What I am getting at is that whilst the approach described by Ramirez makes sense, and particularly makes sense within *that* specific, personal, locality, according to the very same postmodern values which underscore the whole of my thesis, we must accept that there are *different* specific and personal locations that RtD might want to grapple with too. To refer to Lyotard's analogy, we should remember that the rules of the game which Ramirez has defined are contingent, although they work in the context of *Ramirez's* playbook, those rules, by virtue of their postmodern construction, are subject to modification according to context (Lyotard, 1984, p. 66).

In addition there seems to be a slight tension at the core of Ramirez’s concoction. Given the *explicit* alignment to postmodernism, Constructivism and Constructionism, some other aspects of the assemblage are articulated with a sort of anxiety. This angst is demonstrated in the apparent search for *objective* truth, a truth which—according to its own theoretical underpinning—we should acknowledge is somewhere between being elusive and unattainable! For example, Ramirez calls outright for data (and by inference, methodological) triangulation of any RtD-derived findings; “while Research through Design can be part of the data gathered in a research project, such data needs to be compared with other data from the world [...] in order to avoid being a purely subjective and uncritical work of research” (Ramirez, 2009, p. 2). It is this pursuit which leads the approach towards Grounded Theory and Situation Analysis. Now the problem is, that through to the postmodern lens with which we’re viewing the landscape, even a moderate pragmatist would probably agree that a technique that can meaningfully provide *external generalisability* (Maxwell, 1992)—that is a an approach that can develop insights for contexts *beyond* the one of study—is, to a more or lesser degree, unachievable. If we accept that this is the case, then outside of a *specific* case, taking the time to explore triangulation strategies is rather futile. In contrast to Ramirez, this is a position I adopt.

I have used the term ‘assemblage’ in this discussion, which in part is inspired by John Law’s use of the term *method assemblage* in his dissection of social science research methods (Law, 2004). Reflecting on Law’s discussion while constructing his own method assemblage for an RtD-based doctoral thesis, Gradinar points out that given the general lack of order in the world around us, expecting sanitized and routine methods to provide universally applicable answers necessitates equally messy research design (Gradinar, 2017, p. 12). In Law’s characterisation he likens methods to reality detectors and amplifiers. As with the *audio* amplifiers used at music festivals (where an array of equipment must be brought together; compressors, power amps, tweeters and woofers), the *reality amplifiers* that are research methods must be brought together in appropriate combinations too. When they are they reveal “patterns of relations in the excessive and overwhelming fluxes of the real” (Law, 2004, p. 15). As sound engineers are to audio equipment, researchers are to research methods. While I share *most* of my approach with Ramirez’s assemblage, insofar as the attempts to design subjectivity out of the system by relying on triangulation and Grounded Theory, the assemblage of methods I have employed strives for rigorous production of knowledge somewhat differently and is less concerned about the limitations this subjectivity brings to our overall pie (discussed in more detail below in 3.4. Designing a Research through Design Project).

3.3.6 Pie Comes in Many Flavours

Before I move on to describe the practicalities of my method, I wish to acknowledge other schools of thought about what constitutes RtD. The lack of consensus about RtD is reflected by the diversity of approaches represented at the conference of the same name (cf. Durrant, 2016). The biennial conference, which will run for the fourth time in 2019, revolves around an exhibition of designed things and academic papers written about the process of creating the

things, and the insights that emerged from them. The intention is to demonstrate how the varied making practices produce domain-specific knowledge but also to explore the nuances of RtD as a research method in its own right. While the conference's attendees and the submissions exhibit a lot of shared ground—often building on Frayling, making a nod towards Donald Schön, and adopting positions that, in the round, are constructivist (*ibid*)—in RtD, as with pie, there is a huge variety in size, shape, appearance, and flavour. The approach utilised for this doctoral research adopts Ramirez's epistemological blueprint, but so as to strengthen that position I include this section to reflect and acknowledge other approaches, and critiques of RtD that have, through either their incorporation or exclusion, helped to inform and contribute to my methodology.

Cal Swann builds an argument that design practice is, in essence, a type of Action Research. To build his case Swann traces the evolution of design from a trade activity closely tied to the industrial revolution, through the emergence of design professions, to the more contemporary realisation that casts design as a distinct field or discipline. Alongside he follows the evolution of theories of design, identifying the positivist to postmodern pivot: “For more than twenty years, the belief that research in design (or serious study of any kind) should be founded in scientific objectivity and positivist formulas went almost unquestioned” transitioned towards “Design is for human consumption”, and it “derives its creative energy from the ambiguities of an intuitive understanding of phenomena”. This shift can also be seen in terms of the more extreme poststructuralist points of view, for example “all discourse contains many meanings” and “interpretation depends as much on the reader as on the writer” (Swann, 2002, pp. 50–51). The end point of Swann's introductory discussion is Mike Press's assertion that “A designed artefact is a researched proposition for changing reality” (Press, 1995).

Against this epistemological backdrop Swann makes a compelling argument that there are stark similarities between the structures of design processes and of Action Research processes. First and foremost, amongst these similarities, is that the ‘structure’ of either process is, in fact, a moveable feast and is rarely stable, generalisable or transferrable between contexts. While simplistic models of design processes tend to describe a sort of sequence that involves problem finding, research, analysis, synthesis, production, and evaluation, more sophisticated empirical enquiries reveal more nuance. For example, oftentimes it is necessary to go through several iterations of this cycle as prototypes are slowly refined into finished products, yet, quantifying the ‘right’ number of iterations is a fruitless task. Moreover, it's perfectly normal for there to be traversal back and forth between the layers, or across multiple layers, as new understanding of the problem, materials, and solution develop (cf. Cross, 2011). Turning to Action Research it can be described as “a program for change in a social situation”, a description which bears a striking resemblance to Press's of design. As with design, the simplistic models of Action Research that reduce it to cycles of *plan, act, observe, reflect* have been much debated, and in practice are demonstrably *not* linear or predictable. The similarity is such that “it would require only a few words to be substituted for the theoretical frameworks of action research to make it applicable to design” (Swann, 2002, p. 56). While

Ramirez prefers to build an epistemology from a postmodern Constructivist stance thus reserving Action Research as more of a practical guiding principle, Swann’s argument highlights an independent epistemic leg that RtD could intellectually sustain itself with, if needs be. For the sake of simplicity, and with Adams’ feelings about the moon and Norwegian beaver cheese in mind (see 3.1, p. 37), I prefer to simply align with Ramirez’s overall position, but acknowledge Swann’s argument as an alternate, and as to partly articulate why I do not feel the need to agree with Ramirez’s call for Grounded Theory in his epistemology for RtD.

While serving up their very own type of pie, Frankel and Racine reiterate how literature appears divided about the “ambitious” phrase RtD, but their main contribution is to reword Frayling’s categories:

“By relating Frayling’s terms—design for, about, and through research—to those of contemporary funding bodies—clinical, applied and basic—and of current practice this paper attempts to provide continuity, while sorting out the different points of view.”
(Frankel and Racine, 2010)

In their terms ‘basic’ research is research *into* design, ‘clinical’ research is research *for* design, and ‘applied’ research is research *through* design. While their discussion is coherent, there is a potentially ironic issue with their logic—in essence, given a field that is already somewhat fractured, the introduction of new terminology might be counter-productive. In addition to this possible Heffalump trap (cf. p.29), the attempt to map the three terms on two axes (the x-axis going from specific to general and the y-axis going from theoretical to practical) and with a plethora of other terminology overlaid on top (including design methods, design science, theory, epistemology, research-oriented, action-reflection, action research, phenomenology, aesthetics, and wicked problems—to name but a few) results in a monumental conflation of complex ideas. Rather than sorting out the different perspectives, this may well have the opposite effect. While I appreciate the intention, and in fact find the map an interesting visual thought experiment, in terms of arriving at a clearly-communicable and concise methodology, once again Frayling’s categories seen in terms of Ramirez’s notes on epistemology seem far more useful (notwithstanding the fact that, as Frankel and Racine point out, regurgitating the keywords used by funding bodies may be a useful tool for gaining access to research grants!)

Elsewhere Bardzell, Bardzell and Hansen argue that critical analysis, drawing on aesthetics, is a fruitful way generate knowledge from RtD. Their proposal is one that does make sense, and in essence involves reflecting on a piece of work in isolation—there is no particular requirement that the person doing the reflecting was the creator of the work. While the fact that understanding can be gleaned in this way intuitively makes sense, it is also quite clear that this sort of analysis is very different to insights arising from the reflexive practice of an artist or designer. While introducing this HCI research, the authors assert that “what HCI researchers call ‘research through design’ maps more closely on to what Frayling called ‘research for design’ (no clear explanation is given for why

this assertion is made). The potential to confuse what the paper says about critical analysis with knowledge produced as part of RtD *practice*, alongside the note that suggests many other researchers' use of the term RtD is 'wrong'—mean this paper is another that, although aspiring to *clarify* how RtD relates to knowledge production, actually confuses them (Bardzell, Bardzell and Hansen, 2015).

Ken Friedman is highly critical of the Frayling-derived conception of RtD. Friedman's dressing-down of the Frayling categories hinges around the distinct properties of, as he sees them, explicit and tacit knowledge. In essence the position is that all theorising utilises explicit knowledge, whereas some craft and design involves tacit knowledge, hence some descriptions of how crafting and design can produce knowledge are false. Speculating as to *how* these "category confusions" have become so widespread he suggests many of the scholars citing Schön, have not in fact read the text. Although that, in some cases, may be true, an alternative explanation is that scholars may have read the text, but took it to mean something different to Friedman did. Friedman's critique is broad, and also describes how Frayling's categories are the result of an ill-advised interpretation of prior work *and* that the categories themselves are ambiguous (Friedman, 2014). Although undoubtedly based in some interesting, if 'academic' (see 2.5, p. 35), discussions, I find myself unable to incorporate any of Friedman's points into my methodology as he describes a position which is entirely incompatible with the contrastingly clear and accessible position that Frayling articulates with his three categories of design research. Let's, for a moment, entertain a thought; what if Friedman is right? What if the categories that Frayling set out, are in fact meaningless, misplaced, and malformed. In this scenario there are many examples of RtD—including doctoral theses, peer-reviewed journal publications and books—that have within them something that is built from an incorrect assumption. Despite having a little bit of 'wrong' inside them I'm confident that the *findings* and the *theory* that these 'wrong' examples of RtD helped to produce will, in many (or, at the very least, 'some') cases, continue to have the same sort of relevance that it would have done even if Frayling's categories were 'right'. A fictional submission to a fictional conference that I co-authored—*Using the Anatidae/Non-Anatidae Algorithm to Quantify the Plausability of Design Fictions*—uses the argument that if it quacks like a duck, and it looks like a duck, then it probably is a duck (Coulton, Lindley and Brown, 2016). Although I'm sure the duck point is a deplorable point of view vis-à-vis Friedman's perspective, what I think is useful to consider is that that if Frayling's categories *look like* they're useful to RtD practice, and if they *look like* they help designer-researchers to understand the landscape where design and research co-exist, then they probably *are* doing both things—regardless of the relationship between theory and explicit or tacit knowledge²¹.

There are many more discussions about the nuances of RtD, and academic arguments about what are the best or worst ways to argue for its strengths and

²¹ This is, in essence, a restating of my introductory note to do with Norwegian beaver cheese and the moon (see 3.1, p. 67).

weaknesses. However, given this research’s particular context, I could not identify any that appear to offer tangible benefits. As per Swann, different theoretical frameworks for what design and research are can be compatible, and interesting, but there is little to suggest that in this case employing such frames would help me arrive at a more useful outcome. Alternative terminology, as per Frankel and Racine, may have some instrumental purpose (e.g. obtaining funding) but in a purely academic sense seems to only add a layer of complexity with no other material gain. As per Bardzell, Bardzell and Hansen, there are many nuanced descriptions of RtD that look at it from some other scholarly perspective, and whilst interesting, tend to only be relevant to quite particular circumstances (e.g. analysing somebody else’s artwork). And, as per Friedman, a foundational principle of my approach—Frayling’s categorisation and discussion of research and design—*may* have some theoretical holes but given the overwhelming weight of evidence that Frayling’s categories and widely adopted approaches to RtD *are* useful, it seems they almost certainly are.

Thus far this chapter has focused exclusively on how ideas fit together *theoretically*, in the following section I continue to consider RtD literature but work towards combining the theory with the practical elements of *doing* the research.

3.4 Designing a Research through Design Project

By virtue of the fact it is intrinsically linked to *design*, and design is a thing that—as Manzini discusses—*everyone* does in the form of practical *thinking and doing* (2015), RtD can, in fact, manifest in practically endless different ways. In some corners of the design stable, scholars have developed design methods to try and harness the unwieldy beast, or to bottle the *essence* of design, however, it doesn’t seem to like being bottled:

“Experience from design practice and from studies of authentic design processes has consistently been that not only don’t designers work as design methodology says they should, it is also a well-established fact that do design in the prescribed manner just doesn’t work.” (Gedenryd, 1998, p. 1)

Applying this to logic to RtD, we might say there are as many variations on how RtD might happen as there are variations in *what can be designed*. In their literature review which intends to federate a range of views on RtD, Godin and Zahedi, noting this feature of RtD, conclude with a slightly defeatist tone, saying RtD is “riddled with issues that come with its heavy reliance on design” (2014). This family of issues—which are seamlessly consonant with the Ramirez’s ironic pursuit of ‘postmodern objectivity’—represents a substantive dichotomy for RtD and pervades the discourse. But, tensions and dichotomies aside, we have to start *somewhere*, and even a postmodern proponent of post-structuralism needs to have some idea of what to do next. So, where does one start? In their handbook on practice-based design research, Koskinen et al posit that the “main hubs” of RtD (what they refer to as Constructive Design Research, and, as noted previously *they* see as a conceptually different thing to

Constructivism/Constructionism) exist in Industrial Design and Interaction Design (2011, p. 8). If one were being argumentative this claim could straightforwardly be refuted based on the pivotal role that Anthony Dunne and Fiona Raby's more artistic design work has played in providing famous examples of RtD. Strangely this influence is something which the same authors, in fact, acknowledge, noting Dunne and Raby's work provides precedent for "doctoral theses [that] build directly on design rather than borrow methodologies and concepts from other disciplines" (2011, p. 28). Although rhetorically couched in *design*, Dunne & Raby's work—which is highly influential²²—may reasonably be cast as a type of *art*, if only evidenced by the fact it seems almost inseparable from gallery-contexts (2013, p. 140). So, even though this observation is somewhat incongruent with Koskinen et al.'s earlier claim, refuting it for the sake of refuting it would be an act of facile futility. The relevance here is that while the land RtD sits upon is certainly not *owned* by Industrial and Interaction design, those practices are residential tenants of the space, and thus we can learn lessons by more closely examining how practitioners utilise RtD. Relatedly, as part of this doctoral research I have published elements of this doctoral research at a variety of interaction design (HCI) conferences. Hence, the HCI purview of RtD provides particularly useful and relevant insights, building upon the theoretical positions already discussed, leading towards a practical discussion of my methodology.

3.4.1 Research through Design; a HCI Hors d'oeuvre?

The term *Hors d'oeuvre* slots into my metaphorically-food-oriented methodology chapter. Etymologically this term—usually used to refer to the small dishes of food one has before the main meal—refers to being 'outside the main'. In HCI, we could say that RtD is outside the main too²³. This probably has something to do with the various disciplinary confluences and tributaries which come together to shape the HCI field as it is today. At the end of the day (or, perhaps more accurately at the *start* of the day) HCI is a computing discipline, a discipline that has more shared roots with a positivist engineering tradition than it does design. The HCI community challenges this though, and the so-called "third wave" of HCI research (Bødker, 2006, 2015) is motivated by the desire to understand the ubiquity of contextually-rich and 'situated' (cf. Suchman, 1987) uses of technology. However, HCI researchers bold enough to rebuff positivism entirely, remain relatively rare (sometimes necessarily so in order to avoid the perish side of the so-called publish or perish culture). Among those 3rd wave HCI researchers, those utilising aspects of RtD to ply their trade are relatively prominent. Yet within the RtD-toting subsection of HCI

²² Note that I'm referring to their influence on RtD. Clearly this influence is in a relationship with related impacts on critical design, speculative design, and ultimately design fiction, however in this instance I'm only speaking about Dunne & Raby's influence on RtD.

²³ That is only if we accept HCI even *has* a 'main' in the first place. Alan Blackwell's intriguing work responds to claims that HCI lacks core 'motor themes' (Liu *et al.*, 2014) by arguing that HCI is in fact an "Inter-Discipline", or one that connects together ideas from various other places and is in a constant state of flux (Blackwell, 2015).

researchers, there is still disagreement, and arguably still a lot of influence from hangovers of the first and second waves (in fact, the drinks which constitute the second wave hangover are still very much *being drunk*). Notwithstanding the history, it is the nature of the *current* situation that concerns us here. *That* is one which is best summed up by contrasting papers that advocate for specific models and formal approaches to RtD (Zimmerman, Forlizzi and Evenson, 2007; Zimmerman, Stolterman and Forlizzi, 2010) with a position that is more oriented towards having a dialogue around what we might expect from to achieve from RtD (Gaver, 2012).

Zimmerman, Stolterman and Forlizzi’s critique of RtD exhibits same sort of anxiety that Ramirez’s epistemology did, in the very first sentence of the abstract they say there is growing interest in RtD “as a legitimate method of inquiry” (p. 310)—the connotation being that it *might not* be legitimate in the first place, or, is ‘outside the main’ (2010). Their critique—which is built from a review of literature, a series of interviews with RtD practitioners, and reflection on some RtD projects—hits some notes that I wholly agree with, notably the lack of a clear coherent RtD paradigm at the moment, and that through constructive critique the RtD may become “robust and stable over time” (p. 318). However, other aspects of their position seem disconnected from the realities of *doing* RtD, and perhaps are coloured by HCI’s substantive gravitation toward the intoxicating effect of the positivistically-minded first and second waves. The crux of their argument is to highlight the apparent lack of “criteria for specifying appropriate approaches and for evaluating the quality of contributions” alongside an absence of “method[s] to document the knowledge [...] that emerge from this kind of research” (p. 310). After explicating a position on this argument, which is then triangulated vis-à-vis interviews, critique of practice and literature, the paper resolves to a call to action to develop strategies for delivering these things specifically for RtD.

I am somewhat critical of this call, however, and the Zimmerman, Stolterman and Forlizzi position has not hugely influenced my approach. Although I do agree with some parts of the argument, my scepticism, I think, stems from my overriding feeling that the direction suggested is in opposition to the Postmodern and Constructionist perspectives that *my* epistemological position on RtD requires. This is a somewhat challenging point to articulate, but linguistically the calls for protocols, processes and procedures fit into didactic meta-narratives that even a moderate postmodernist should be forgiven for taking exception to (particularly within the creative context of ‘doing Design’).

Beyond the *how you do it* of RtD, another area critiqued is how it is *evaluated*, “what constitutes high quality outcomes and measures of success, that is, how can and should RtD projects be evaluated and how can theoretical contributions from this research be critiqued and valued” (p. 317). The point which seems to have been missed here is that the means of assessment and the process by which the thing being assessed was produced are intrinsically linked. It is for this reason that it’s impossible to codify a protocol, process or procedure for assessment or production ahead of time. It is also the reason why the call for projects that *explicitly* set out to develop theory using RtD seems a flawed one,

and perhaps deliberately setting out to find and/or test a theory would only ever import more subjectivity into RtD processes. Many of the designers that were interviewed mentioned Donald Schön and his hugely influential work on the *Reflective Practitioner* (1984). Weirdly, however, noting the interviewees consensus around documenting how their perceptions changed (probably inspired by Schön), Zimmerman, Stolterman and Forlizzi infer this reliance on reflection as an integral part of practice means that a *standard* is required. Distilling the ultimately particular process of individual reflection on a specific design projects into a protocol to be recycled does not, intuitively, seem like a useful strategy for legitimising or promoting the virtues of RtD.

Within this paper there are, of course, areas that are commensurate with my view on RtD. In particular I identify with the breadth of possible RtD utilities or outcomes: for example, turning insights into design methods, design theory, or *other* theory, and alternatively as an ideation or critical tool for supporting another process, developing conceptual frameworks or guiding philosophies, and understanding insights of ‘the preferable’. Although I’m not sure that Zimmerman, Stolterman and Forlizzi are happy with this position, I concur with the sentiments behind RtD framed more as an “attitude to doing work than a systematic method of inquiry”. Also, the examples cited in this paper do a good job of highlighting how RtD really works. Generally, the projects involved interdisciplinary teams, and, the nature of the RtD-derived contributions to knowledge was clearly diverse and context specific.

“Knowledge generated from this work included new interaction design paradigms [...] and new research methods [...] members critiqued their design and knowledge generation process, offering actionable information for other RtD efforts” (Zimmerman, Stolterman and Forlizzi, 2010, p. 315)

The three accounts of RtD practice—which follow in a similar vein—*do* seem compatible with the postmodern Constructionist position. Particularly when we note that on the occasions RtD explorations result in theory production, oftentimes it “might not have been the original intention” (p. 316). Also, the overarching motivation of this paper I identify with, and I concur that through critique a viable and useful consensus about RtD may emerge: “RtD is here to stay and severe critique is at this stage not detrimental to the approach” (p. 317). Notwithstanding the slight tension between the contingency of design activities, and the positivistically-infused rhetoric²⁴ which calls to “develop protocols, descriptions, and guidelines for its processes, procedures and activities” (p. 317), this paper may be cast as a call for the establishment of an RtD paradigm.

²⁴ Zimmerman, Stolterman, and Forlizzi conducted this work while based at institutions in the United States of America. They also note that all the projects they cite were conducted in Europe “where design as an academic and scholarly activity seems to have more legitimacy and more stable funding than it does in the United States” (p. 316). Although merely conjecture, it seems plausible that what I interpret as a positivistic style is, in fact, the style necessary to succeed when doing academic design research in a North American context.

Providing an alternative view on the status of RtD, Gaver describes a position which, although similarly motivated to Zimmerman, Stolterman and Forlizzi, comes to quite different conclusions. It has a ‘softer’ thrust and, the apparent certainties of protocol and procedure, focuses on reasonable expectations instead (2012, p. 938). Gaver agrees that RtD produces knowledge in the form of theory, but that emphasises that we should anticipate those theories to be “provisional, contingent, and aspirational”. Further he discusses the diversity of approaches seen within RtD, suggesting that “this variation need not be seen as a sign of inadequate standards or a lack of cumulative progress, but may be natural for a generative endeavour”. Lastly, he calls for caution with respect to the desire to converge and standardise, suggesting that doing so would neglect to recognise the value of RtD’s “ability to manifest the results in the form of new, conceptually rich artefacts” (p. 937). Gaver is careful to express sympathy with the concerns that underpin calls to make RtD methodical, and cites the implicit need for “disciplinary legitimacy within HCI” as a possible driver, but, outweighing this sympathetic view he notes the risk of a form of “self-policing” that might stifle RtD’s ability to “continually and creatively challenge status quo thinking” (pp. 937-938). The practical conclusion of the Gaver position is that rather than universally agreed upon theories the *core* of what constitutes RtD-type research is ‘designed’ examples, these designs may be *annotated* by theories (which the designs themselves may or may not have helped to produce). In doing so “design theory’s provisionality, specificity and diversity [may be] turned to advantage through grounding in specific sets of detailed design examples” (2012, p. 946).

Though the conclusions of Gaver’s position seem straightforward and are arguably intuitive, the construction of rhetoric is careful and deliberate; undoubtedly in part it is tailored for its audience (i.e. the CHI conference, and its historic tendency toward scientism). Initially setting the scene, Gaver explores prior examples of RtD, and discusses the range of ways that theory seems to intersect with practice. These intersections are various and include drawing upon non-design theory (e.g. theories of embodied movement or ecological psychology) to meaningfully and critically inform design practice; manifestos which articulate themselves through design but draw upon other theories to justify themselves (e.g. reflective design or ludic design); the development of ‘design ontologies’, and methods toolkits fit for particular design contexts (e.g. the product ecologies). The initial examples, however, are only included to frame a much deeper set of questions: how *good* are these endeavours?

To understand the qualities of such intersections between design and theory Gaver considers Philosophies of Science. He employs a tentative answer to the rhetorical question above in order to illuminate the characteristics of RtD and in doing so problematises accounts of research (not just design research) that are prone to scientism. The two ideas Gaver considers are Popperian falsifiability (that a hypothesis—and by extension any derived theory—is meaningful only insofar as it is semantically possible to disprove it) and Lakatos’ articulation of ‘scientific programmes’. These two points of reference are not utilised to try and cover the entirety of the Philosophy of Science, but rather to provide two ‘spot

measurements’ from contrasting positions. Popper argues that no matter how many examples are provided in support of a theory, they cannot *prove* it. Meanwhile any single example which is incongruous with the theory can disprove it. Therefore, any theory should be measured against its “falsifiability, or refutability, or testability” (Popper, 1953). Lakatos’ takes a more pragmatic view that transcends individual theories and can be described as *research programmes* instead. These assemblages may have a kernel of theory at their core, but the theoretical centre is bootstrapped and shrouded by additional hypotheses, evidence, and various approaches to answering any given programme’s unanswered questions (Lakatos, 1978). Considering these points of view serves a number of purposes when constructing a meaningful method for doing RtD. Although it may be, on some basic level, possible to consider a finding derived from RtD as falsifiable, that falsifiability would only make sense within the very confined context of any given project’s very specific “ultimate particularity” (Stolterman, 2008, p. 59)—hence it is not a generally useful way to legitimate a theory. This is another reflection of the aforementioned critique that RtD is “riddled with issues that come with its heavy reliance on design” (Godin and Zahedi, 2014). Alternatively, we might say that RtD contributes to a broader programme, and hence so long as an RtD project can lead to some—even tangentially—related outcome, then it is worthwhile. The main purpose of considering Popper and Lakatos is to “illustrate how unsettled and controversial accounts of science are” and to, particularly within the context of debates around using RtD as it is used in a HCI context, destabilise “the use of ‘science’ as shorthand” (Gaver, 2012, p. 941). In doing so, Gaver provisions a solid foundation to *not worry* about how scientific (or conversely, unscientific) RtD based theories are, and instead to give more weight to the actual content of, and presentation of, RtD-based work. It is through that presentation that it might derive its gravitas.

While Gaver points out that, in Kuhnian terms, RtD is *pre-paradigmatic*—i.e. that multiple incongruent perspectives simultaneously exist—he goes on to identify a broad consensus that, although oft-not-discussed is very much present²⁵.

“It is the speculative ideas, the novel, and disagreements that we are most likely to discuss. This may lead us to underestimate the discord of science, and to overestimate the divergence of research through design. From this point of view, calls for standardisation, formalisation, overarching theory and the like are misplaced; we already share many of the attributes of a research paradigm, and seeking to reduce diversity its cutting edge will just inhibit progress.” (Gaver, 2012, pp. 942–943)

²⁵ Recently Jeffery Bardzell made a similar point, clearly pointing out the vast amounts of common ground among the relatively small disagreements; “Design Researchers Need a Shared Program, Not a Divorce” (Bardzell, 2018).

Even if there is a relatively similar amount of discord within scientific paradigms and an overestimation of divergence in RtD, it’s also worth reminding ourselves that many disciplines in the arts and social sciences don’t converge as the natural sciences do. Instead they elaborate on the prior, cumulatively building layers. This happens because these are generative practices, and as such alter their own realities; they change the nature of the situation upon which they act. This feature of RtD is interesting from two angles. First it highlights (as Ramirez discussed, see p. 48) the crossover and synergy between Action Research approaches and RtD. Second it reminds us that RtD endeavours are concerned with “what might be” as opposed to “what is”—design research *creates new realities* (Gaver, 2012, p. 940). Those realities are extremely contingent and *may* only have relevance to the specific—ultimately particular—context from whence they came. Conversely, however, they *may* have some broader applicability. Gaver suggests that by bringing together multiple examples in the form of an ‘annotated portfolio’ the scope of applicability stemming from an *individual* element of a portfolio can come into focus (cf. Gaver and Bowers, 2012). Bringing multiple points into focus, the borders of any individual piece’s ultimate particularity are widened. Befitting an RtD proposal, what annotated portfolios actually are is not *precisely* specified—“a balance is achieved between descriptions of specific, detailed examples of design practice, and articulations of the issues, values and themes which characterise the res among the collection, and to which the [design] examples suggest answers” (Gaver, 2012, p. 944). Neatly, however, the annotations which make up annotated portfolios are the explication of the theories which emerge from the artefacts. In this way, for Gaver’s RtD, theory is rarely more than a means to annotate the *facts* of RtD; where the facts are the designed artefacts themselves.

The HCI research juggernaut has inevitably (and fittingly, given the prior notes on the paradigmatic status of RtD) produced a range of other perspectives, positions and interpretations on what RtD is, how we might conceive of it, and how to use it. These are too numerous to cover exhaustively, but include Bardzell, Bardzell and Hansen’s nuanced and sometimes complex exploration of how designed things may act as knowledge producers for those that *interact* with them as well as those who *create* them (Bardzell, Bardzell and Hansen, 2015); Pierce calls out the relatively small range of examples that RtD scholars sometimes draw upon and practically discusses issues around RtD and publication in HCI venues (Pierce, 2014); Blythe has even progressed the conversation towards Design Fiction, suggesting it may be used to inform the early stages of developing RtD projects (Blythe, 2014). Although I acknowledge their existence and intrigue, the depth and nuance of these conversations about RtD, even within the relatively small walled-garden that is HCI research, are superfluous with respect to the methodology I am constructing. In fact, the elements discussed thus far in this chapter are all sufficient to construct the *menu* that is the overall methodological, epistemological and ontological assemblage that the thesis builds from. Making reference to the earlier parts of the chapter, I bring together the constituent elements and summarise them in the following section.

3.4.2 Bringing Together All the Elements on a Plate; Feasting on the Methodological *Menu du Jour*

First, I should reiterate the notes from my introduction. Most of what I present in this chapter can be distilled to the same process a child goes through when figuring out how to construct a model of a ship, but without the instructions. By materially engaging with the constituent parts, the ship can take shape, and as a by-product understanding and insights are produced. With this summary restated, what follows is a more involved discussion of how the various elements discussed *a priori*, are amalgamated into my methodology.

Providing the appropriate framing, we must substantively remember Frayling's notes about the crossover between the practices of design, research and science. These are not isolated entities but related places within the same gamut. Similarly, although it's useful to codify the possible outcomes when the constructs of 'design' and 'research' interact (i.e. in terms of research into, for and through design) it's also *crucial* to acknowledge that oftentimes all three types overlap within a single situation; for example I may use somebody else's research *into* design to inform how I go about doing research *for* design in order to ultimately conduct a research *through* design activity (see Figure 5). Within this circular economy of design and research, the occasions upon which a designing/making practice results in the development of new insights, *those* are perfect examples of RtD as it is meant in this thesis. Although it makes intuitive sense that new knowledge can be produced in this way, Ramirez provides a useful theoretical framework for how this makes sense epistemologically. Fundamentally this is built on a platform of postmodernism, but more specifically draws on the demonstrable qualities of Constructivism and Constructionism as mechanisms by which insight emerges, albeit through—in contrast to positivist approaches, at least—somewhat subjective means. As discussed previously the ground betwixt these two related areas of study is muddy (sometimes the terms are used interchangeably) however, for *my* methodological assemblage the Constructionist position takes some precedence because it privileges tangible, material, *construction*—in other words, *making stuff*. At the point Ramirez makes an explicit alignment to Grounded Theory and Situation Analysis, my approach departs from his. Although the need for such pairings makes sense in *some* circumstances—as John Law puts it the mess of the world is necessarily reflected in messiness of methods in any given research context (Law, 2004)—Grounded Theory and Situation Analysis don't appear appropriate parts of my assemblage. The foremost reason for this is an ontological difference; I align closely with Gaver's position that theories derived from RtD are, almost certainly, not falsifiable in the Popparian sense—hence a positivistically informed research method such as Grounded Theory is almost inevitably going to produce spurious results. So, trying to be rather more Post Modern about it, and side-stepping the apparent positivist anxiety imported into RtD demonstrated both my Ramirez's tendency towards Grounded Theory and Zimmerman, Stolterman and Forlizzi's call for explicitly specified methods and evaluative frameworks, instead I turn to the Gaver position on RtD. This is an approach to practice-based theory production, which accepts that theory

produced is likely to be generative, aspirational, and contingent (and by extension accepting of its own temporal limitations; i.e. it may change over time). *This* is the approach to producing Design Fiction theory I employed with this doctoral research. Finally, Gaver and Bowers’ adaptable proposal for Annotated Portfolios as a way to structure RtD endeavours provides a useful blueprint for how to articulate the meta-structure that my individual case studies fit within. Against the backdrop of the onto-epistemic position set out thus far, in the following I describe the practicalities of applying these ideas in what I term a ‘material engagement’ with Design Fiction.

3.4.3 Time to Wash the Dishes, and Doing Design Fiction Research through Material Engagement

By this point in the chapter the food puns and metaphors are becoming bland—perhaps ‘under seasoned’ should be the correct term—but the comparative lack of flavour in this section, the trailing edge of my methodology chapter, is probably apt²⁶. The thing is, that the quite overtly metaphorical take on epistemology—the story about my construction of the Graf Spee model—is, in its own way, an attempt at a high-brow conceptual manoeuvre. The subsequent discussion of postmodernism, Constructionism, and epistemology for RtD—these too are overtly scholastic and wholly ‘academic’ discussions. In this section I move away from discussions about *why* the approach I have adopted should work as an approach to producing an original contribution to knowledge, and instead segue into what I actually did.

Much of Gaver’s interpretation of RtD, and subsequent call to present RtD derived-theory as annotations to examples, is, as well as being couched in rhetoric around the Philosophy of Science, constructed from the acceptance of any given design case’s uniqueness or ultimately particularity. This accounts for the fact that the term Design might mean architecture, service design, graphic design, interaction design, choreography, food design, and so on. Extending from the position that Frayling establishes for RtD (1993) we can cast each different type of design as a different type of ‘material’. The act of *doing* RtD involves a practical engagement with these materials. Take concrete as a—pun intended—*concrete example*; if you had never encountered concrete before, you could explore it by touching it, pouring it, and ultimately observing what the results of these ‘material’ engagements would be. You would quickly learn that it eventually goes hard, but that it can be shaped beforehand. More complex material engagements with concrete may teach you that it is a poor insulator, is

²⁶ It would be remiss of me to not add this footnote. Having successfully navigated my doctoral viva in September 2018, I am currently writing corrections. As my examiner Professor Nick Dunn points out “do the food metaphors help before this point?”. Whilst their utility can be disputed, I’ve decided to leave them in—even at this point in the thesis, where I concede I’m somewhat bored with the food metaphor. The reasoning is that, while they don’t *directly* contribute to the communication of the thesis’s contributions, indirectly they *do* help by situating the words on the page in terms of my personality and how that ‘essence of me’ is inseparable from the thesis’s contributions to knowledge. Given the personal tone throughout the thesis, I’m sure this is likely to do more good than harm.

not fireproof, and can be porous. Clearly, when the thing being researched has more facets than a single physical material, things get a bit more complex, but, the same underlying logic of RtD through material engagement applies. The ultimate particulars for any given RtD case—the reason why a researcher might engage with a material in a specific way—relate directly to the type of material(s) that case is constructed from.

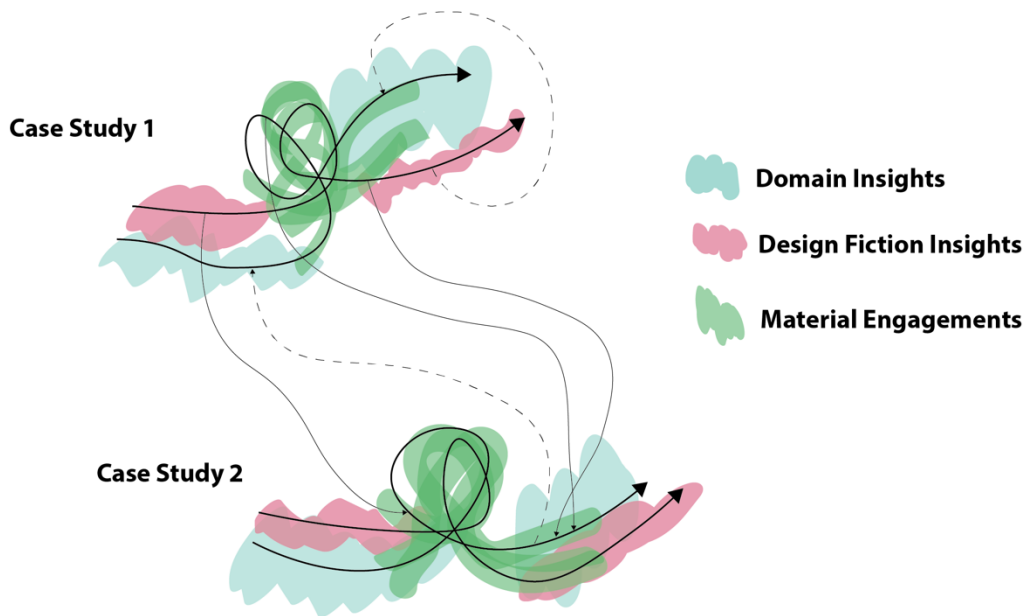


Figure 6. Visualisation of how a portfolio of case studies interact to produce knowledge as part of an RtD process (After Pollastri, 2017).

My cases—each one based around an attempt to construct a Design Fiction—are defined by unique assemblages of materials, hence the way my material engagements have played out is inconsistent across the cases²⁷. Of course, across these elements of individuality and uniqueness, the unifying factor is they may all be described, in some way or other, as Design Fiction. So, in what follows (4. Case Studies, p. 65) I present, what is in essence, a portfolio of Design Fictions. Each one of these has its own context, these are explained on a case-by-case basis. Common among all of the cases, however, is that they experiment with and build upon pre-existing ideas about Design Fiction. At the outset most of these already-existing ideas are those detailed in my literature review, while, as my research progressed later cases built upon findings resultant from earlier cases. This process, although intuitively quite straightforward, is quite hard to articulate academically while maintaining suitable clarity. In her doctoral thesis Serena Pollastri does this with aplomb, supported by a series of simple but highly effective diagrams (2017, pp. 107–

²⁷ If my thesis was addressing a more specific question, e.g. “The properties of video as a medium for Design Fiction” then there would be more commonality, however given the very general questions—e.g. “What is design fiction?”—my cases have *had* to stray further afield. and hence my material engagements are all as unique and, therefore not directly comparable, as the cases are.

123), of which Figure 6 is an adaptation. It shows how a series of case studies, as part of an RtD process, may feed one another in a multitude of relationships.

This visualisation is represented in the common structure that the case studies in the following chapter are presented through. Each has the following sections; introduction, context, process, domain insights and Design Fiction insights. The structure allows the onto-epistemic position and the methodological commitments to be easily adhered to, while not stifling the Design Fiction practice or application of RtD. For the sake of clear communication too this structure offers some consistency too. The introductory and context sections for each case serve to contextualise why that *particular* Design Fiction became part of the research, and why it may be of interest both in general, and in service of the thesis’s underlying research questions. Given the impossibility of including the actual Design Fictions themselves within the text of the thesis²⁸, the process sections provide an opportunity to explain what the Design Fiction actually is, and to articulate the twists and turns involved in producing it (in Figure 6 this is represented by those areas highlighted as ‘material engagement’). Inherently, then, the process sections are the reflexive precursor to the knowledge that the RtD process results in. Each case begins with my current understanding of Design Fiction and understanding of the domain area, then culminates in findings or insights relating to those areas (represented in Figure 6 by the areas highlighted as ‘domain insights’ and ‘Design Fiction insights’). The distinction between these two threads is reflected in the structure that my case studies are described within. While it is only the Design Fiction insights which *directly* contribute to the core research question of the thesis, the former is of indirect consequence by virtue of the fact that the quality and nature domain-specific insights is certainly pertinent to the central questions. These two insight sections are, in Gaver’s terms, the theoretical annotations one might expect with a RtD-centred Annotated Portfolio doctoral thesis.

3.4.4 A note: by Case Studies I mean Studies of Cases

Characterising precisely what is contained in the Case Studies chapter under a single term is not completely straight forward. Each section represents scholarship (of varying sorts) around an instance of Design Fiction (of varying sorts) and produces insights (of varying sorts). Drawing on the non-academic lexicon, I generalise this collective of varied-but-related examples as ‘Case Studies’. In this context then, I mean ‘Case Study’ to refer to the study of a case, nothing more and nothing less. This demands clarification because of the potential confusion with a term in the academic lexicon: ‘Case Study Methodology’. Case study, in the academic sense, refers to a research method with a broad and varied history across many disciplines including law, anthropology, psychology, and organisational science. Across its wide and varied employment epistemological debates persist, factions coalesce, and individual scholars using the method align with the place that suits their comfort

²⁸ Do please refer to the external links within the cases studies themselves to access relevant materials.

zone. Because of the long and varied history, “There is some danger in using a well-worn term like case study. All such terms carry ‘excess baggage’ around with them, surplus meanings and resonances from these previous usages” (Robson, 2011, pp. 135–136). Setting aside the bulk of case study’s excess baggage for a moment, and going right back to dictionary definitions we can see two popular usages for the term case study:

case study
noun

- 1 a process or record of research into the development of a particular person, group, or situation over a period of time: *the case study was undertaken over a period of two months through a series of visits to the school* | [*as modifier*] : *case-study interviews*.
- 2 a particular instance of something used or analysed in order to illustrate a thesis or principle: *airline deregulation provides a case study of the effects of the internal market*.

The first definition refers to the research method discussed above, but the second simply means considering a particular instance of something in order to illustrate a point. *That* is the sense in which my case studies are case studies. Semantically you could equally well call my case studies ‘instances of scholarship’, ‘occasions of inquiry’, or ‘illustrations of research’. However, compared to the familiar and commonly-used term ‘case study’ such monikers seem cumbersome and confusing, hence, accepting that it would necessitate this clarifying paragraph, I describe the particular instances used to illustrate my scholarship as *case studies*.

4 Case Studies

4.1 Overview of the Case Studies

Although these cases are presented as distinct entities, in *reality* sometimes projects overlap, get suspended, are resurrected, become reformed, are renamed, and sometimes totally canned (but even then, elements of them might get recycled). While some of this detail is omitted, wherever it helps to articulate or to evidence how findings emerged, these extracurricular ingredients are explained. Each project in this chapter is unique, there are variations in the media used, the intended audiences of the Design Fictions, the underlying motivations, criteria for success, and of course what insights resulted. What they have in common is a practical and material exploration of Design Fiction. Also, in spite of this ‘ultimate particularity’ (cf. Stolterman, 2008, p. 59) they have all been distilled into a common structure: introduction, context and process followed by discussions of any domain specific insights and Design Fiction insights constructed in the process. Broadly speaking, the introductory sections explain my motivation for embarking on a particular project; what the aims of it were or ‘where I was at’ when the project begun. The context sections are, where appropriate, miniature literature reviews along with any other contextual information which is necessary for the account of the process to make sense within the thesis and to frame the subsequent insights meaningfully. An alternative way to characterise these context sections is to say, if we consider Design Fictions as ‘what if?’ questions, then these context sections explain *why* one would ask that particular ‘what if’ question. The process sections, in the simplest possible terms, describe what I did, but also serve to describe the aspects of the cases which cannot be wholly represented as text (i.e. explaining the visual and media parts of the projects). This includes practical descriptions of the creative processes and design decisions, but *also* serves to provide some of the projects’ annotations. Furthermore, it is frequently the case that a project may have had a fractured life with several different phases. Where appropriate these details are also included in the process sections. In line with my view of RtD, and as described in the methodology chapter, the reality of these case studies is that the interplay between reflection, practice, and findings is not necessarily a one-directional, transactional, or linear process. How to broach this complexity and arrive at a useful way to represent the insights—no matter how messily they were produced—is a subject I have deliberated over extensively. In the following I discuss the compromise that I concluded was the best option that resulted in the structure I used.

It would be ideal to hold all of the content relating to each study’s context, process, reflexivity, and any findings associated with a particular case ‘in the same place’ and to somehow be able to represent and/or explicate each simultaneously. Moreover, it would be nice to have each one of these self-

contained accounts segue into the next project, and for all of this to happen chronologically. If this were possible, and after sequentially accounting for each project in this manner I would then, if I could, synthesise all the results into a summary conclusion. The realities of the research do not fit the convenience of the idealistic, however. With this messiness accepted the strategy I elected to employ, and the account that follows, forces the cases into a standardised structure that consists of introduction and context section, details of the process by which findings were arrived at, and finally discusses the insights that were produced. With each case described the overarching conclusions are presented in the subsequent chapter. This approach although not structurally representative of the fact that many of the insights and design processes were happening simultaneously (as per Figure 6), does at least allow for clear signposting of when different things were happening synchronously, but hopefully in a palatable way. Moreover, this structure is intended to disencumber the reader, and, in essence, sublimate the findings into digestible, bite-sized chunks.

Throughout the process of completing this thesis aspects of the research have been published in a variety of venues, and subsequently those findings have formed the basis for further postdoctoral research. In light of this Figure 7 is included to serve several purposes. First, the diagram shows research published that stems from the thesis in chronological order. Second, where case studies have directly contributed to the content of a published work, that is indicated by connecting them via straight lines. Third, insights stemming from each case study are listed and some of the relationships between them are mapped. Fourth, specific points are highlighted and related to the research questions that the thesis seeks to address. Lastly, for completeness, the diagram includes reference to the Literature Review and Methodology chapters, showing indicative links between them and publications/insights. It would not be possible to describe or articulate *all* of these relationships because they are, in reality, innumerable, fluid, and evolving. Notwithstanding this mutability, the assembled resources aim to guide the reader as much as possible toward a clear understanding of the cases and how they ultimately cohere to support the thesis's conclusions. Figure 5 (p.44) is constantly relevant, as it articulates the constant interplay between knowledge silos and research process. Similarly, Figure 6 (p.62), is pertinent as it suggests the multiplicity of relationships between different parts of the case studies. Figure 7 (p.67), puts the entire process in context, relating the case studies to specific insights and showing how these inform both a body of previously published research and the thesis's conclusions alike. Finally, the accounts of the individual cases describe textually the process of arriving at the insights that, when amalgamated, address the research questions.

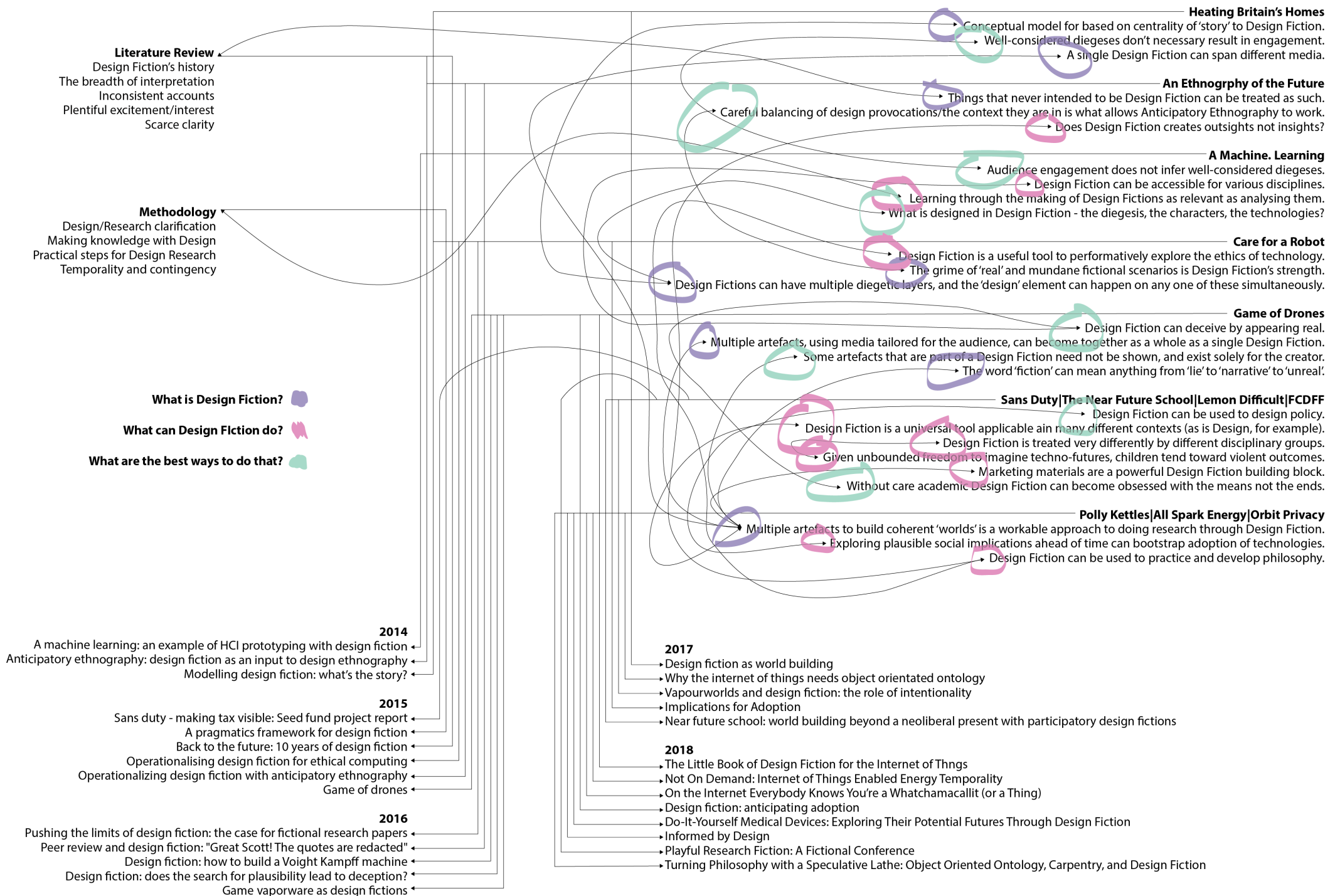


Figure 7. Mapping process, publications, case studies, insights and research questions.

4.2 Heating Britain's Homes, the Bitcoin Radiator, and the Ministry of Crypto Finance

4.2.1 Introduction

This was my first foray into Design Fiction practice and was a product of my original intention to research the future of Bitcoin and cryptocurrency using Design Fiction as a research tool (see p.2). One factor involved in creating this Design Fiction was my desire to submit it to an academic workshop (titled 'StoryStorm'), which was held at the ACM's Designing Interactive Systems conference in 2014²⁹. The workshop was focused around how 'storytelling', in its many forms, frequently appears in research contexts as a way to develop hypotheses and to otherwise contribute to the development of products and services. Although this is a position I have subsequently developed a much more nuanced view on, at the time I and others (see 2.3.1) described Design Fiction as a story telling practice, which meant it segued neatly with the workshop's aim to "map the range of conscious and unconscious storytelling tools adopted in research processes and artifacts" (Maxwell, Woods and Abbott, 2014). In the call for contributions to the workshop, the conveners also explicitly asked for submissions that used Design Fiction in some way—this is what caught my eye. Given the relatively early stage in my PhD, a stage where I was still wrestling with the research process itself, as well as being at the base of my learning curve to do with Design Fiction, contributing to the workshop seemed like an ideal first practical step to take along my doctoral journey, as well as opening up the possibility of seeing other examples of Design Fiction from other attendees.

As will be explained more comprehensively below in the process section, the project ultimately became multi-staged and developed significantly over time. The first of these stages resulted in me creating a short Design Fiction film – titled *Heating Britain's Homes*³⁰ - I then co-authored a 4-page paper (titled 'Modelling Design Fiction: What's the Story?') based upon the process of making the film, which I submitted to the StoryStorm (Lindley and Coulton, 2014). Subsequently I expanded the project adding extra elements to the Design Fiction, intended to be viewed in concert with the film. The various iterations of the project were exhibited at Synergize 2014, Edinburgh College of Art, and finally a larger exhibition at the ACM's Creativity and Cognition conference in 2015 (Lindley, 2015b).

4.2.2 Context

Bitcoin is "A purely peer-to-peer version of electronic cash" first envisioned in the infamous whitepaper published by Satoshi Nakamoto (2008). Whilst Bitcoin

²⁹ <http://dis2014.iat.sfu.ca/index.php/workshops/#W103>

³⁰ <https://www.youtube.com/watch?v=TmXo0-vIu-k>

is the most visible example, there are in fact a large number of derivative ‘coins’, these are collectively known as ‘cryptocurrencies’. These cryptocurrencies rely on using a cryptographically-secured distributed ledger referred to as a ‘blockchain’. The principle laid out by Nakamoto is for a secure mechanism which facilitates creating, storing, and transferring what he refers to as ‘electronic cash’. Although electronic cash, or virtual currency, was not a new idea in 2008, or unique to Nakamoto, his approach to implementing such a system was notable because it addressed the flaws which previous attempts at implementing electronic money systems over several decades had failed to (Harvey, 2014). Most significant of these challenges was the problem of preventing electronic money from being spent twice, which itself is a relative of the question ‘how do I know you are you who you say you are?’. Previously implemented incarnations of virtual currency always relied on a trusted central authority to manage this authentication challenge (e.g. traditional banks, PayPal, or Second Life’s Linden Dollars). In essence these systems keep a central ledger of who has what money and have some mechanism to authenticate a particular person. If you are authenticated, and your account has a balance, then you are allowed to spend the money (‘spending’ is often as simple as updating the ledger/database to show that what I spent has been moved to somebody else’s account). Managing to remove the reliance on a central authority and simultaneously finding a solution to both the authentication problem and the associated ‘double spend problem’ is the key technological innovation behind Bitcoin. The specific technology which makes this possible may be referred to as ‘blockchain’.

Nakamoto’s blockchain proposal suggested using public/private key cryptography to create a *public* ledger (in contrast to banks, who keep this information privately) which keeps track of and shows precisely what balance every single ‘address’ (Bitcoin’s version of an ‘account’) has in it. Using cryptography, it is possible to *guarantee* that when somebody attempts to ‘spend’ a Bitcoin, *they* are the person who has the authority to spend it and that they actually *do* have the Bitcoin in their account to spend. This is achieved by cryptographically signing transactions in such a way that the system can be say with *complete* confidence that whomever made the transaction was in possession of the ‘private key’ necessary to make that transaction (of course, this does not prevent private keys from being stolen—but that’s another matter).

A further issue with digital cash systems, particularly one that has no central authority, is the question of how to introduce new currency to the system. With Bitcoin, Nakamoto defined rules which would introduce currency at a rate set according to a predefined schedule. Whilst the system which manages this is rather complicated, and is somewhat beyond the scope of what we need to discuss here (cf. Nakamoto, 2008; Becker *et al.*, 2013; Kroll, Davey and Felten, 2013), in summary the process works thus. Anybody who wants to can connect to the Bitcoin network to participate in what has become known as ‘mining’. Mining and miners process, verify and ‘package’ Bitcoin transactions into ‘blocks’. These blocks are added to a chain (hence the term blockchain) which contains within it an indelible history of every single Bitcoin transaction. In order for the Bitcoin network to be secure the combined computing power of

the miners needs to be at least equal to the computing power a potential miscreant might have (due to the system architecture if an attacker had more processing power than the network, then they could steal everybody's Bitcoins!) As such, to motivate people 'donate' their computing power to the Bitcoin network, and thus protect it from attack, the system is configured to reward miners for their computational contribution. These payments of Bitcoin are also the means by which new currency enters the Bitcoin economy. This rather neat design, where one problem becomes the solution to a different problem, it is also a significant reason why Bitcoin has managed to remain simultaneously disruptive and resilient³¹.

The Bitcoin mining ecosystem has changed dramatically since the system was launched. Initially casual users would run the mining code on their laptops and receive relatively large numbers of Bitcoins as a reward (resulting in a plethora of Bitcoin-related stories such as 'throwing away \$4 million hard drive'³²). However, as the value of Bitcoin increased from virtually nothing to a few dollars, miners began to speculate that the *future* value of Bitcoin may be *much* higher, and hence they were happy to add more computing power to the network. Although this came at a significant expense (in hardware and electricity) the more computation power an individual has on the network, the higher the proportion of the rewards they receive, so those gambling on a future price increase were prepared to invest significantly. Before long the Bitcoin network became (and still is) the most powerful computer network in the history of computing. Although making direct comparisons of 'power' is difficult in this space (because the Bitcoin network only does one type of operation, SHA256 hashing) in some senses the Bitcoin network is somewhere between 10,000 and 100,000 times *faster* than *all* of the world's top 500 super computers put together³³. Whichever way you look at it, the Bitcoin network is 'significant'. Using standard consumer hardware to mine Bitcoin is not possible today, now specialized 'Application Specific Integrated Circuits' (ASICs) are incorporated into custom mining machines, which have no purpose other than to mine Bitcoins. A whole new industry was born to design and manufacture these machines, which are often installed in dedicated warehouses, cost hundreds of millions of dollars to set up, and consume large amounts of electricity to run. The energy used by the Bitcoin network can only be estimated but is definitely significant. Precise figures are nigh on impossible to maintain, but one expert estimated consumption in 2016 was around 600,000 megawatts (around 1.5% of UK total energy draw on an average springtime day³⁴. This

³¹ It has also resulted in a potentially catastrophic amount of energy being consumed by the Bitcoin network and a tendency toward centralisation, factors that may, ultimately, undermine the experiment (Hazas, Zhang and Lindley, 2017).

³² <https://www.theguardian.com/technology/2013/nov/27/hard-drive-bitcoin-landfill-site>

³³

https://www.reddit.com/t/Bitcoin/comments/5kfuxk/how_powerful_is_the_bitcoin_network/

³⁴ <https://www.cryptocoinsnews.com/as-mining-expands-will-electricity-consumption-constrain-bitcoin/>

obviously has an environmental impact too, some (arguably conservative) estimations suggest that by the year 2020 as much as 4,000kg of carbon dioxide may be incurred in order to mine a single Bitcoin (assuming 50% carbon free energy production)³⁵. As well as requiring electricity, another common attribute of computation is that *heat* is a by-product. It was the interplay between these factors which began to interest me, and I was motivated to create a Design Fiction that explored them. Financial and innovation opportunities presented by a booming Bitcoin economy (market capitalization of \$122 billion as of April 2018) and the breakthrough blockchain system, fuelled (and continues to fuel) a computation/mining ‘arms race’, which henceforth consumes vast amounts of electrical energy, most of which is discarded in the form of waste heat. I wanted to use Design Fiction to explore some of the following questions. What would a future with ubiquitous Bitcoin mining look like? What kind of future world would it be where Bitcoin mining was ‘everyday’? In this world, how could the energy consumption, value-creation, and waste heat equation be balanced?

4.2.3 Process

4.2.3.1 Heating Britain’s Homes

At this early stage of my research my conception of Design Fiction was highly conflated with notions of story, narrative and the medium of video/film (a position which, as you will see throughout the remainder of this chapter has changed significantly; this change is partly due to the seeds sowed by this project). I was also, at this point in time, wrestling with the notion of Research through Design—my methodology had not solidified, and I wasn’t clear on the details how RtD would ultimately help me arrive at the doctorate’s contribution to knowledge, or what its epistemological commitments would be. Having engaged a certain amount of blind faith in the idea that ‘something good will come of it’ preparing a submission for the StoryStorm workshop was an ideal stimulus to engage in creating my first Design Fiction. I had already been observing the Bitcoin community for some time, and my interest had piqued so far that I had built various ‘home brew’ mining machines (e.g. Figure 8)—something that, in 2014 was still viable as the ASIC arms race was only just beginning—I knew that a medium-term future was of far more interest to me than the contemporary one: the community was defined by intense, and detailed, speculations around the hardware, software, and adoption of the technology. I, however, was more interested to explore a slightly more distant future where, potentially, Bitcoin would have become ubiquitous. At a time when the mystery around the Bitcoin creator’s pseudonymity was at fever pitch (fuelled by the belief that he/she possess many billions of dollars’ worth of Bitcoin³⁶), also new hardware for mining Bitcoin was emerging daily, and coverage of Bitcoin (which had previously been niche and a rarity in the popular media) was becoming increasingly commonplace. I was motivated to explore a potential

³⁵ https://motherboard.vice.com/en_us/article/bitcoin-could-consume-as-much-electricity-as-denmark-by-2020

³⁶ https://en.wikipedia.org/wiki/Satoshi_Nakamoto

future world where Bitcoin was normal, commonplace and every day. What would that world look like?

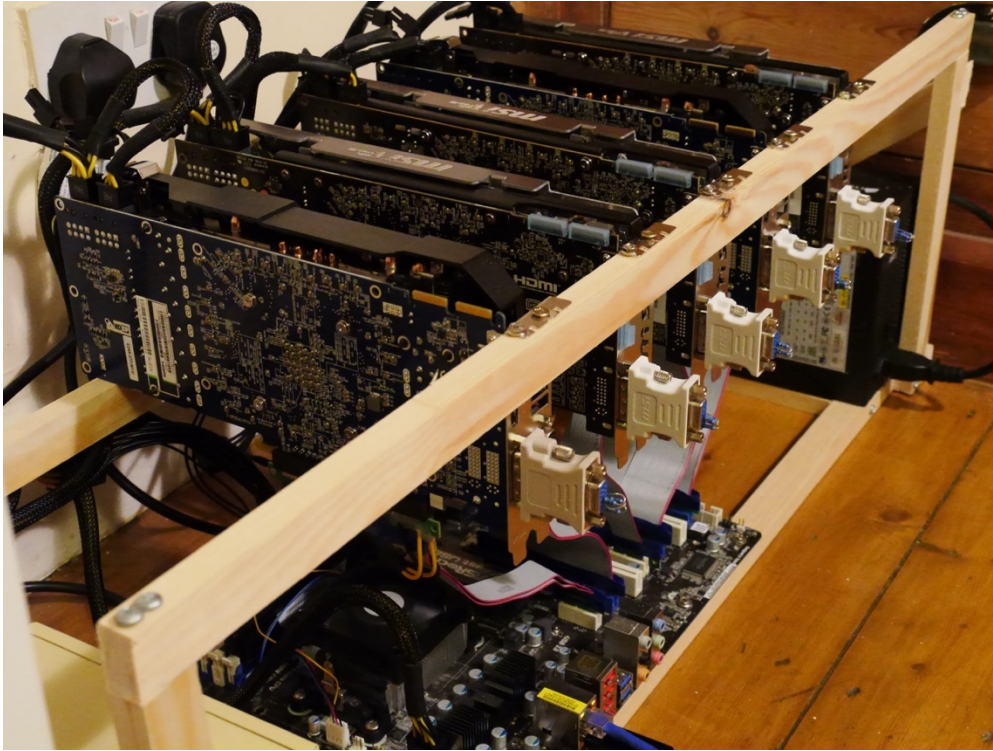


Figure 8. Example of a homemade GPU-based mining machine.

Alongside my curiosity to do with the mining arms race and associated energy consumption, an interest in a near future where Bitcoin's usage was an everyday occurrence percolated too. Alongside, my perception of Design Fiction as narrative, story, and film, was in tension with some rather more practical constraints. I needed to get this work done *quickly* in order to meet the deadline for the workshop I was targeting, and I had to do so with limited resources, and with no prior experience. In the context of the PhD, these practical constraints actually seemed quite pertinent, the constraints I was under were probably a realistic analogue for other researchers who may want to use Design Fiction for similar purposes. Hence, whilst some part of me was crying out to have several months, a big budget, a stack of expensive equipment, and a team supporting me, the actual situation was quite relevant to the context.

At the time tensions between Vladimir Putin's Russia and the West of Europe were becoming increasingly tense (the annexation of Crimea and the downing of Malaysia Airlines MH17 over Ukraine had *not* occurred yet, however). Also, in the news were the UK's beleaguered banks who were struggling to become profitable among the fallout from the 2008 economic crash and the payment protection insurance scandal. Then, as now, and for all of the foreseeable future, our changing climate was never far from media publicity, government policy,

not to mention real world impacts on people (e.g. major flooding in Lancaster³⁷). Joining these thoughts together using Bitcoin as the glue provided me with a workable format that would fit within my constraints. This took the form of a retrospective story, set in the future, using type-based fictional newspaper headlines and a voiceover to create a diegetic landscape. Curiously the decision to create the film does not, strictly speaking, have any ‘designs’ in it whatsoever. Rather it creates a backstory to a future which *could* have various design concepts in it. Hence the film, and the newspaper headlines within it, create a world where the ‘designs’ (which I will elaborate on below) would make sense.

In this alternate world—this Design Fiction’s diegesis—several factors come into play. In summary: Russia faces continuing sanctions over Crimea. The West become increasingly scared of Putin. The UK, and Western Europe, have become dependent on Russian oil/gas imports, which in turn strengthens Putin’s diplomatic position as well as increasing fear of it. The UK government seeks ways to become more independent. It is revealed that in 2008 one of the failing UK banks had, at a very early stage, *massively* invested in Bitcoin. Bitcoin’s price continues to sky-rocket. UK winters become increasingly cold as a result of climate change.



Figure 9. Example (made up) headlines from the Design Fiction.

The actual design (of a thing) which all of this world building existed to support, was for a domestic heating system to replace gas or electric heaters in homes. Rather than using traditional mechanisms to translate energy into heat, *this* system used ASIC chips mining Bitcoin to generate their heat. So, essentially these are electrical heaters, but in order to generate the heat they are doing ‘computational work’. This work results in the production of Bitcoin, which itself has a value. The value of the mined Bitcoin can be offset against the value of the electricity used to create it, resulting in subsidised—maybe even free—heating. In the fictional world I had created using the newspaper headlines, this way of creating heat made a whole lot of sense. First, the UK needs an alternative means to heat its homes, given that in this world the Russian fossil fuels upon which the UK had become dependent are no longer viable. This problem is exacerbated by the colder winters (a plausible effect of ongoing climate change). In addition, the UK, still reeling from an economic downturn, was looking for a way to re-balance its economy and banking sector. The revelation that one of the state-owned banks had a huge stake in Bitcoin

³⁷ <http://www.bbc.co.uk/news/uk-england-lancashire-35020049>

combined with Bitcoin's continually increasing price, offered the government a risky but potentially rewarding opportunity; to rebrand the City of London and make the UK a worldwide hub for trade and services around cryptographic finance. Finally, as well as dealing with the practical and national need for affordable heating (particularly pertinent with colder winters), if widely adopted this technology would protect the Bitcoin network itself, thus protecting the UK's investment in it.

4.2.3.2 Bitcoin Radiator

Although the fictional world I envisaged was, in some ways politically farfetched (although, in a post-Brexit, Trump, and Macron world, 'farfetched' should be seen as a relative term!) in this particular scenario the technology was so achievable that I elected to embark on building it myself. My intention with building a physical component was to explore the role that physical pieces may play in Design Fictions. I was concerned with quite fundamental and basic questions (albeit questions that were not addressed anywhere in the literature): if something is a *physical* piece, is it still Design Fiction? If it is *functioning* is it a Design Fiction? How do multiple artefacts combine, can they, collectively be a singular example of 'Design Fiction'?

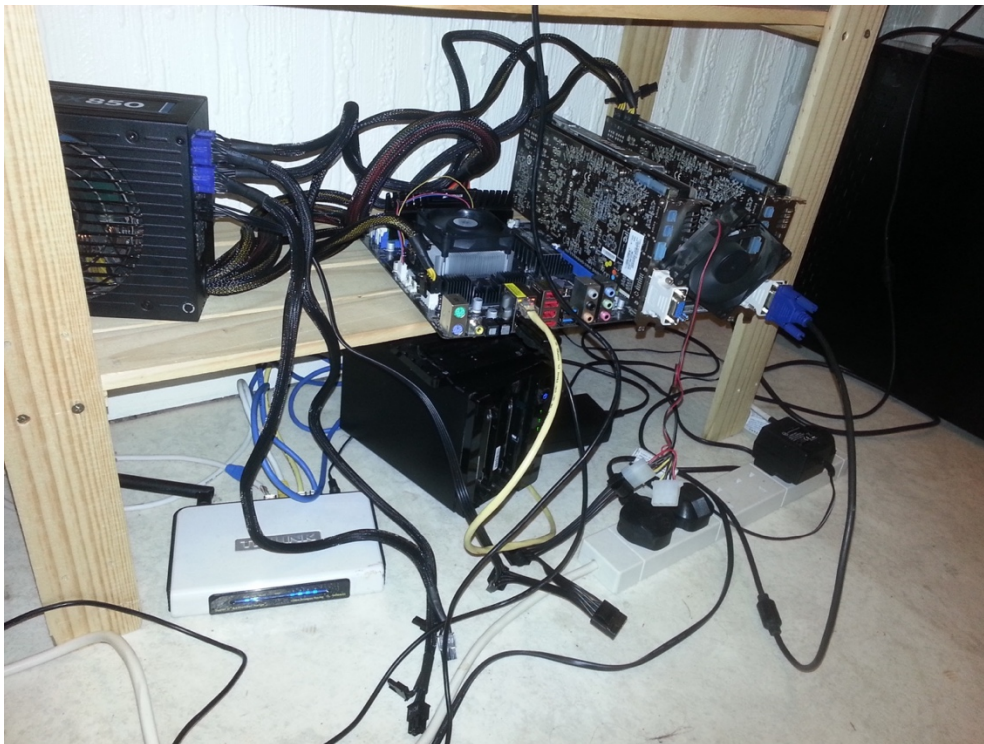


Figure 10. Prototype-prototype of the Bitcoin Radiator. Two GPUs attached to a motherboard running the Scrypt mining algorithm. Note the additional fan between the two GPUs (in addition to their already highly specified heatsinks) that was necessary to dissipate the extreme heat. These GPUs run at 80°C when mining.

For this project I elected to actually utilise a computer that was fit for mining Litecoin rather than Bitcoin. The two cryptocurrencies are almost identical but Litecoin uses a different hashing algorithm ('Scrypt' as opposed to 'SHA256'). The Scrypt algorithm was intended to be more resistant towards the development of ASIC chips for mining, therefore keeping the financial barrier to entry low, and thus meaning that mining should be accessible to individuals and resist the centralisation which engulfed the Bitcoin network³⁸. Litecoin and Bitcoin have a related value, and one can be traded for the other, hence for the purposes of this account Litecoin is synonymous with Bitcoin.

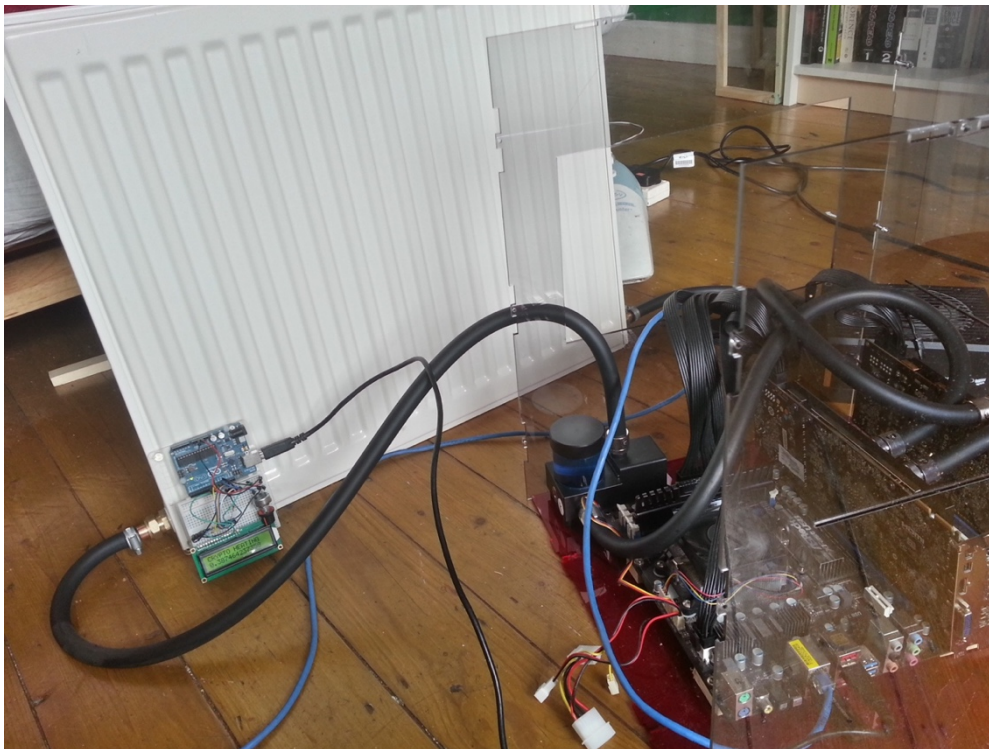


Figure 11. Prototype of the Bitcoin Radiator with basic water cooling loop set up.

The decision to make my miner based on Litecoin meant that rather than having to procure and adapt an extremely expensive, and hard-to-come-by Bitcoin ASIC, I could build my prototype around a standard personal computer. My aim was to build a computer that was capable of mining using Graphics Processing Units (GPUs). Once I had a working mining machine I intended to adapt it so that rather than using air cooling, the GPUs, they would be cooled with a water cooling system, which could then be pumped through a household radiator. These designs involve removing the original heatsink and fan, then replacing them with a heatsink which can have water pumped through. Such heatsinks are commercially available and are usually aimed at gamers who wish to overclock

³⁸ See <https://medium.com/@homakov/stop-calling-bitcoin-decentralized-cb703d69dc27> and *Bitcoin's energy use is out of control ... but maybe that's the point?* (Hazas, Zhang and Lindley, 2017)

their GPUs to increase performance, however the same systems were perfectly fit for my purpose.

The radiator went through various iterations progressing from a ‘prototype-prototype’ which simply proved that the mining was possible (see Figure 10); an interim design which used water cooling but still looked very much like a computer that was exhibited at Synergize 2014 and Edinburgh College of Art (Figure 11), to finally arriving at a household radiator mounted on a wall and was exhibited at Creativity and Cognition 2015 (Figure 12).

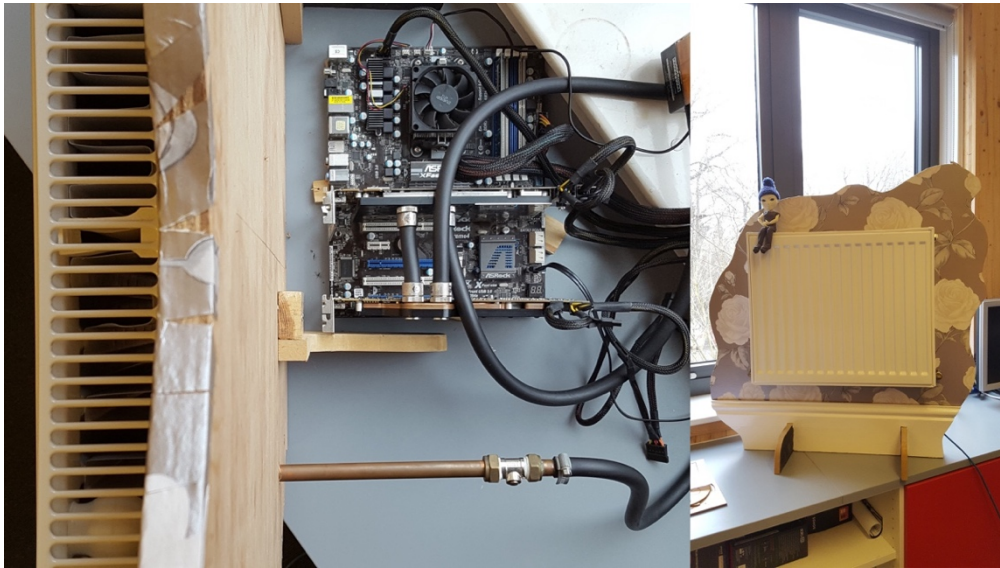


Figure 12. Example of the Bitcoin miner attached to a wall-based radiator.

The finished Bitcoin Radiator mined cryptocurrency and heats water inside the radiator to around 70°C (dependent on ambient temperature), the monetary cost of this heating—once offset against the value of any cryptocurrency which is mined—depends entirely on market conditions. However, for the period that the system was running and being exhibited in 2014, the net cost was in fact negative. In other words when the system was running it was ‘profitable’.

4.2.3.3 The Ministry of Cryptographic Finance

During 2015, with the film and prototype built, I took the opportunity to submit the work for inclusion at the ACM Creativity & Cognition conference’s exhibition. In order to show the work in a gallery setting and for it to be engaging for the audience I felt the project needed additional elements to help ‘invite’ the audience into the fictional world/diegesis without being artificially lead or coaxed. My decision was to try to create something that was akin to an industry exhibition stand such as one might see at a consumer electronics or trade other trade show. This stand, as would make sense given the diegetic landscape of this project, would belong to the governmental body tasked with promoting this ‘cryptoheating’ technology and attempting to foster its adoption in the UK population. To perform this role, I envisaged a fictional governmental body

named the Ministry of Cryptographic Finance. In terms of exhibiting the work I elected to create two 'roller banners' which together form a kind of physical 'informercial' for the Ministry. Along with the Bitcoin Radiator, these formed the basis of the exhibit.

The content on the banners was intended to both communicate the concept at the core of the project whilst also reinforcing the combined diegetic landscape. One banner (see Figure 13) posed and answered three questions, with brief snippets of text, aimed at potential customers: What? (is cryptoheating); How? (does it work); Why? (would you do this).

The 'What?' question includes marketing-style copy claiming this 'accredited system' will save you money, boost the economy, and reduce carbon footprints. The intent was to directly state what the Bitcoin Radiator could potentially achieve. More nuanced elements connect quite intricately with the interior texture of the project's diegesis and add layers to the landscape originally laid out in the Heating Britain's Homes film. The 'How?' question introduces the basic premise of recycling the excess heat from Bitcoin mining, but also notes that the system can be retrofitted to your existing central heating system (a factor that would be extremely relevant to the system's financial viability). The 'Why?' question conveys much of the sentiment detailed in the film: that high energy prices are causing widespread fuel poverty in the UK and that cryptographic finance has become central to the UK economy.

CRYPTOHEAT
the future of warmth

what?

Cryptoheat is the future of domestic heating. Using our Ministry of Cryptographic Finance accredited cryptoheating system you will save money, boost the economy, and reduce carbon.

now?

Hashing for the Bitcoin network converts computing power into money. Computation unavoidably creates excess heat. Cryptoheaters join the dots. Using your existing central heating to provide cooling for the hashing chips we can offer you with the most financially efficient domestic heating in the world.

why?

Domestic heating costs in the UK are at an all time high, fuel poverty continues to grow. At the same time 27.8% of our GDP is dependent on the Crypto Finance sector. Cryptoheaters provide the most financially efficient heating, while strengthening the UK's position as the world leader in Crypto Finance.

CRYPTOHEAT
don't be a fuel fossil

free upgrades

As the network gets faster, our chips must too. We provide free chip upgrades to ensure that your heating will always be the cheapest possible.

insured & safe

The amount of money you can save by heating your home with Cryptoheaters has traditionally been pegged to the publicly traded price of Bitcoin. Starting in 2019 and backed by the Government, OFGEM will insure against Bitcoin price drops, leaving you safe in the knowledge that your bills will always be cheaper.

Free consultations available now
Compatible with all central heating systems
heatme@cryptoheat.gov.uk
@cryptoheat via BitMessage
Use this PGP key for secure comms

Ministry of Cryptographic Finance | ofgem | DEPARTMENT OF ENERGY & CLIMATE CHANGE | Digital Economy

Figure 13. Marketing banners for the government backed Cryptoheat system.

The second banner speaks to some issues that would arise with this system if it were to be implemented, and shows how the provider (in this case the UK government) may mitigate risks for the consumer, in order to drive widespread adoption. For example, reference is made to the amount of money you can save previously being pegged to Bitcoin price. The inference of this statement is that that if the Bitcoin price crashed, you would in fact not save money but make a loss compared to other forms of heating. To mitigate this problem, the banner explains that the government will insure consumers against a Bitcoin price crash. Another practical factor of the system relates to the ‘difficulty’ factor in the Bitcoin mining ecosystem. In short, Satoshi Nakamoto designed the system so that a new ‘block’ would be released roughly every 10 minutes. However, if

the many new miners connect to the network, blocks are found quicker than that (more computing power increases the chance of the block being found). As a result, the ‘difficulty factor’ is taken into account, and automatically increases the difficulty of finding blocks relative to the total mining power on the network. In the real world, the impact of this, is that mining hardware becomes outdated and unprofitable extremely quickly. Within the diegesis of the Ministry of Cryptofinance this would mean that the ASIC mining chips inside Bitcoin Radiators would become financially unviable within a year, or at most two. Hence, the ministry promises free chip upgrades, and a graph demonstrates their extrapolation of chip miniaturisation (i.e. potential speed) mapped against the network difficulty. In practice this would necessitate a modular design, where old chips could be swapped out for newly miniaturised and more efficient ones. It would also mean a constant development programme to allow for chips with the same size and power requirements to fit into the same physical housing.

4.2.4 Domain Specific Insights

During the lifetime of the project, and during the time since I moved on to other work, the issue of energy consumed by computers in general terms has grown significantly. For examples, according to some estimates ‘the Internet’ consumes as much as 10% of global energy supplies. Bitcoin itself has had a volatile journey in terms of scandal, hacks and price, however its value—taken over a long period of time—continues to grow, the amount of energy used in mining grows, and other blockchain/cryptocurrency systems such as Ethereum are beginning to be adopted. Around the same time this Design Fiction was made, various start-up companies³⁹ began providing services not dissimilar to the one described in this Design Fiction, but rather than focusing on cryptocurrency would move the kind of computation usually found in data centres to homes and reuse the heat for hot water. This aligns with my own feeling that developed during the project, why, specifically would one such a system to cryptocurrency? Why not open it to more general computing? During the same period large technology corporations need for sophisticated cooling has continued to grow too, and in turn investment into research to mitigate the problem has grown, including providing heating in some instances⁴⁰. More recently (2018) a company began selling an Ethereum mining rig in the shape of a radiator⁴¹, recreating my mining prototype.

One practical reason to stick with the cryptocurrency model for computationally-supported domestic heating is that the system architecture is so simple, there are no concerns around transporting large volumes of data or potentially sensitive personal data. However, these issues, which do seem unfathomable in the context of individual houses, seem to be less of a logistical

³⁹ For example, see <http://www.alphr.com/technology/1000776/replacing-hot-water-with-data-the-servers-that-heat-your-home>

⁴⁰ For further examples, see <http://www.datacenterknowledge.com/data-centers-that-recycle-waste-heat>

⁴¹ See <https://www.theverge.com/circuitbreaker/2018/3/9/17100068/qarnot-qc-1-cryptocurrency-mining-rig-heater-home-electricity-ethereum>

challenge if one would consider building-level data centres in buildings of multiple occupancy. A further practical alternative to the system proposed in this Design Fiction would be one that involved a district scale computationally-powered heating centre that could provide the heat energy for a paired district heating system.

A final, but unavoidably clear issue with recycling computationally derived heat in the form of domestic heating: the desire for warmth is seasonal, the desire for computing power is not. How would excess heat be dissipated or otherwise used during the summer months and/or how would the sudden lack of computing power be compensated for when or if it were turned off because it was hot?

4.2.5 Design Fiction Insights

In the early stages of this project, whilst producing the Heating Britain's Homes film, I devised a 'model' which I found useful for considering how I was building the Design Fiction; it seemed useful as a sort of structure for dismantling others' work and also as a tool for discussing my own Design Fiction with peers. It breaks any given Design Fiction into smaller constituent parts. The model is constructed from three layers, here illustrated left to right. The extreme left edge represents factual reality, 'the now'. The extreme right edge represents the diegetically prototyped fictional future worlds, and the things in those worlds. The blue areas on the diagram hints at the proportion of each layer's content that should be fictional, with the grey areas inversely corresponding in terms of factual content. Throughout this project, and for a significant period of time beyond it, this model was a significant part of my conception of Design Fiction. Having a relatively simple semantic structure for the essence of what Design Fiction 'is' made the process of creating them, talking about them, and communicating them to others, far easier.

The **reality layer** describes the world today as particular sets of users may know it. It refers phenomena, technologies, and knowledge that exist now. It is from the reality layer's grounded foundation that the other layers are contextualized, the reality layer acts as a lens to focus the image of the fictional world, and ideally make it appear plausible to the viewer. In Heating Britain's Homes, the reality layer includes contemporary truths such as: climate change causes extreme weather; tense diplomatic relations between Europe and Russia; crypto currencies becoming part of the zeitgeist.

The **story layer** builds upon the reality layer, extrapolating the facts, and extending them into a plausible fiction. By carefully (careful to make sure the links between the two are not absurd) building the fiction atop the grounded reality, the story layer creates a plausible, but blank, canvas upon which a designed provocation can be painted. In Heating Britain's Homes, the story layer adds complexity and plot to the fact-based-assumptions of the reality layer. The nuance of the Europe-Russia diplomatic thread is teased out with elements that are not inherent necessary for either provocation or fiction layers to make sense, but nonetheless strengthen the overall effect and add texture. In this case a reasonable extrapolation directly from real news events was intended to lend

the story layer’s construction some essence of reality, whilst clearly situating the whole project in an alternate future.

Finally, the **provocation layer** is where the *thing being designed* (which may be a product, a service, or anything else) exists. The provocation layer is where the diegesis created by the other layers is put to work and utilised when it is populated with the ‘design’. In Kirby’s words the designs that exist in the diegetic space have advantages because “these technologies exist as ‘real’ objects that function properly and which people actually use” (Kirby, 2010)—albeit within a fictional world. As I hope will be clear from this account, the original Heating Britain’s Homes film *had no* provocation layer, but those were added later in the form of the Bitcoin Radiator and Ministry of Cryptographic Finance work.

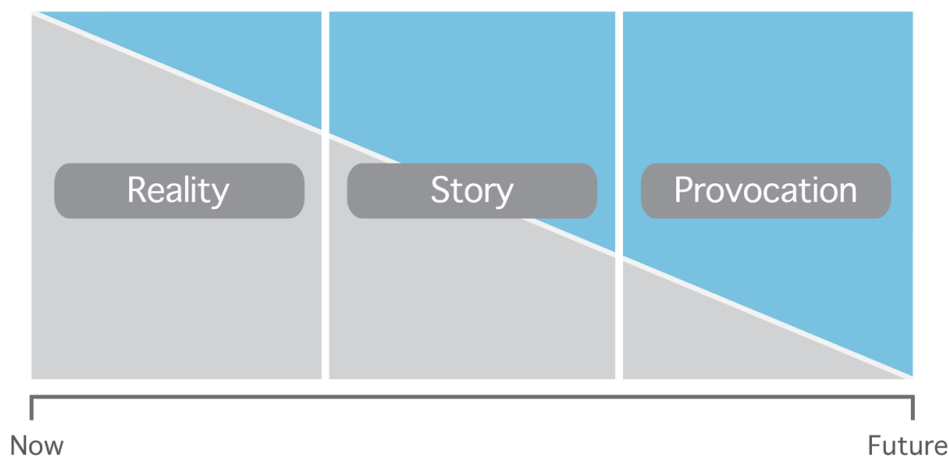


Figure 14. Model of Design Fiction Derived from Heating Britain’s Homes Project

This model was an early attempt to deconstruct and understand the essence of what Design Fiction ‘is’ and while I believe it may still be useful, my thinking has progressed to a point where I firmly believe the metaphor of the three-layered model is, in at least one significant way flawed because of reliance on the misleading (in the context of Design Fiction) term ‘story’ (see 5.2.2, Design Fiction is World Building, p.141 for a specific discussion).

4.2.6 Summary

This project was pivotal as it was the catalyst to turn the PhD from a piece of research about Bitcoin, to a piece of research about Design Fiction. By the time I had completed the project it was clear that Design Fiction was not a media-specific practice (i.e. not confined to video/film) and as such as single Design Fiction could easily span several artefacts and medias. The intricate back story of this Design Fiction, intended to integrate and dovetail the technological capabilities of Bitcoin, contemporary news events, and pervasive concerns about climate and energy, is a piece of work I am proud of, and I think for the right audience is quite evocative. *However*, it was clear that the Heating

Britain's Homes film struggled to speak to audiences without explanatory interventions; when viewed in isolation it very hard for audiences to 'suspend disbelief' and immerse themselves in the fiction. Conversely, the Bitcoin Radiator was extremely evocative, and appeared to be a much more fruitful tool for prising open a discursive space despite the fact that, when viewed alone, this is but a functioning prototype and is arguably *not* a Design Fiction when viewed in isolation. A critical design—perhaps—but given the lack intrinsic placement within a diegesis, a Design Fiction—probably not. In terms of the larger doctoral project this early work laid foundations for developing more nuanced perspectives appreciative of Design Fictions diversity. The three-layered model, although superseded, helped to lay foundations for some of the thesis's conclusions, which will be discussed fully in the subsequent chapter.

4.3 An Ethnography of the Future

4.3.1 Introduction

This piece of work, which does not pivot around Design Fiction *practice* as such but rather uses Design Fiction as a *lens*, was a follow up to the work I and colleagues did around Anticipatory Ethnography (Lindley, Sharma and Potts, 2014). With this experiment we aimed to put the theory into practice and to see what an 'Ethnography of the Future' might be like. Of the 'modes' we proposed in the original research, for this project we adopt and experiment with the third mode (which proposes to study the *content* of a Design Fiction ethnographically). In order to do that effectively it is essential to have the kind of Design Fiction which is optimised to go beyond one-dimensional technology prototypes and instead move into the realm of fully situated Design Fiction; Design Fictions which tactfully communicates technology, people, and context *holistically*. The argument for this approach builds from the notion of 'incidental Design Fiction' (Lindley, 2015a), which says that regardless of whether something was created as a Design Fiction, if has all the hallmarks of it, then it may meaningfully be treated as one. The specific example we chose to base this experiment on and move forward with, was Spike Jonze's 2013 film *Her*.

4.3.2 Context

Anticipatory Ethnography aims to look at Design Fiction artefacts and applies ethnographic techniques to them in order to produce actionable insights in the same way as any 'normal' design ethnographer might do. In contrast to other ethnographic enquiries which are almost always couched in the here-and-now, Anticipatory Ethnography aims to unbind design ethnography from ties to the present.

Emerging from an 'idea-ballet', Anticipatory Ethnography is the result of two distinct practices—Design Fiction and design ethnography—pirouetting around one another creating the silhouette of a new, and unique, whole. The idea is a conceptual alignment between design ethnography's reconfiguration of

traditional ethnography, and Design Fiction's approach to diegetically prototyping the future. There are many synergies between these two distinct practices: stimulating insightful dialogue; supporting design processes; appreciating action and context's symbiotic relationship. If we consider design ethnography's ties to the present (Crabtree, Rouncefield and Tolmie, 2012, p. 170), remember the temporal disinhibition which is core to Design Fiction's utility (Auger, 2013), and finally pay regard to the consonance between the properties of each practice (Lindley, Sharma, and Potts 2014), then a *summary* of Anticipatory Ethnography's value proposition is complete.

In its original formulation three 'modes' of Anticipatory Ethnography were proposed. Each mode is based on observing a Design Fiction artefact, but at different phases of its production and/or consumption. The modes involve ethnographic engagement with either the *process of creating* a Design Fiction; the *audience of a Design Fiction* interacting with it; the Design Fiction *itself*.

The third of these, studying the content of the Design Fiction itself is arguably the simplest to explore. This mode does not require anticipatory ethnographers either to make a Design Fiction themselves, to gain access to the production of a Design Fiction, or to interview other people interacting with a Design Fiction. It relies only on a researcher directly engaging with a Design Fiction artefact. These characteristics, combined with the logic of incidental Design Fictions, make the practicalities of doing an Anticipatory Ethnography in this mode quite straightforward. As it was part of the inspiration for the very early development of the Anticipatory Ethnography concept, and also because it had all the necessary attributes to make it a suitable incidental Design Fiction, I and collaborators proceeded to conduct our experiment using the film *Her* as the source material. Although this was an academic study, the intention was to develop a method that could be used as part of commercial design processes, either directly or with subtle adaptations. Hence, the scope of study is to describe the practicalities of doing an Anticipatory Ethnography with a piece of *incidental* Design Fiction and as *research for design* (i.e. to support a design process).

Consider this paraphrased reduction of Sterling's Design Fiction definition: "a Design Fiction is (1) something that creates a story world, (2) has something being prototyped within that story world, (3) does so in order to create a discursive space" (Lindley and Coulton, 2015a). Imagining how these attributes might map on to a film like *Her*. One, the movie creates a story world (commentary around *Her* and the film's critical acclaim would suggest it did this successfully). Two, the diegetic prototypes within the story world of *Her* are abundant (I will elaborate on these later when discussing insights) and powerful, and are resonant with Bleecker's notes on the value of props as prototyping tools:

"[A] good story with its props may be more effective at materializing an idea than an engineering prototype. We might wonder why more engineers are not drawn to storytelling as a way to prototype their ideas, rather than circuit building or software prototyping. As a means to communicate and disseminate an idea,

not much works as well as the circulation of a compelling story. Hollywood and the entertainment-media network has taught us this much, at least.” (Bleecker, 2010)

Figure 15 shows several of the props that appear in *Her*.



Figure 15. Screenshot of diegetic prototypes / props for the Samantha AI in *Her*.

The third and final property of a Design Fiction, as per the above definition, is the creation of a discursive space. This space for discussion is a product of suspension of disbelief—and any good fiction should, if it is done well, engender some kind of suspension of disbelief and allow those engaging with it to sympathize with the contexts, protagonists, and other elements of the world inside the fiction. An appropriate Design Fiction, then, can “diegetically situate” those engaging with it (Lindley, Sharma and Potts, 2014).

Thus, around *Her*, an incidental Design Fiction, we planned and enacted the process described below in order to experiment with, and test, the technique. *Her* is laden with diegetic prototypes, and through tactful story telling these are diegetically situated in the fictional future world of the film. Set in a near future that is not *too* dissimilar from the world of today (it combines futuristic elements with call backs to 1970s aesthetics), the premise of the story is the release of the world’s first artificially intelligent operating system. It tells the story of Theodore and his new operating system, who, using intelligence, ultimately names itself Samantha. Although the story hinges on the much-feared risks associated with the almost metaphysical notion of ‘Super Intelligence’—the idea that if a machine supersedes human levels of general intelligence in almost all scenarios it will result in the destruction of human kind—it also depicts many more familiar and mundane situations. From Theodore’s late night use of an equivalent to Tinder and Chat Roulette, to the form factor of his smartphone-

like device (albeit equipped with Samantha’s futuristic intelligence), the rich quality of *Her*’s diegesis, which it garnered through a crucial negotiation with the mundane (Foster, 2013), that made it an excellent candidate for conducting this experiment with Anticipatory Ethnography.

4.3.3 Process

The method described here is certainly not the de facto Anticipatory Ethnography method but rather is one intended to test the feasibility of Anticipatory Ethnography in the simplest way possible – in effect a rapid prototyping of the method. For this exploratory experiment, the method and process were deliberately simple.



Figure 16. Affinity mapping during the ‘Anticipatory Ethnography’ of *Her*.

A group of four ‘anticipatory ethnographers’ watched *Her* in its (I was one of them, another was a co-author, the remaining two were post-graduate design researchers with a good awareness of design ethnography). While watching the film, dialogue between the researchers was minimal, and post-it notes were used to capture observations of the characters and action. While all taking part knew the intention was to see if we could use the film to generate actionable insights about technology, no specific instructions about what kinds of phenomena to record were given. Immediately after watching the film the group went through an affinity mapping process (Kawakita, 1982) developing themes from the raw observations. Since this was an academic endeavour and there were no client constraints to limit our inquiry, the range of insights produced was *incredibly broad* (Figure 16).

During the affinity mapping it became apparent that this vast amount of data must be corralled in some way, hence we began to organize our insights into meta categories as they began to emerge. The categories and the specific insights which fit within them are detailed in the following.

4.3.4 Domain Specific Insights

It's worth noting here that the insights recounted below result from data generated in early 2015, based upon a film released in 2013, filmed in 2012, and whose original concept was likely up to 10 years old at the time of production (Michael, 2013). Noting the temporality of the film's production highlights that it is very hard to turn the process we engaged in into a template that could be replicable. Rather, the insights we generated are very much a representation of a moment in time. Even having acknowledged this constraint, however, I believe that the insights below demonstrate that engaging in an incidental Design Fiction by using Anticipatory Ethnography can help to divine useful and usable perspectives on the future in such a way that designers may use the technique to augment and extend more traditional ethnographically-couched design projects.

4.3.4.1 Sound, voice and audio interfaces⁴²

In Design Fiction terms, the system that facilitates the character Theodore's (human) interactions with Samantha (artificial intelligence) is a diegetic prototype of an advanced voice interface. Similar technologies have existed for some time in the form of speech recognition with appropriately programmed responses. More recently applications such as Siri, Google Now, and Microsoft's Cortana offer pseudo-intelligence voice recognition systems underpinned by big data and ubiquitous connectivity. Despite offering elements that *appear* intelligent, these systems are far from adaptable. Similarly, Bluetooth headsets are a staple for anyone wishing to use their mobile telephone while driving or using their hands. The design provocations contained within the diegetic prototypes in *Her*, however, demonstrate that these interfaces are far from satisfactory (in terms of both function and aesthetics).

Despite the video revolution that we have seen on the web, facilitated by increasing bandwidth and the ease with which video content can be created, the web remains primarily a text-based medium. Other contemporary services like 'Chat Roulette' utilize easily available video cameras and bandwidth to connect users on the fly. Meanwhile, internet-telephony is so commonplace that 'to Skype' has become a verb. However, a purely voice-based communication has significantly different properties from text-based methods, this looks like a space ripe for development, particularly in terms of interacting with machines.

⁴² Google's recent research into super-natural sounding AI-powered voice interfaces, see <https://www.nytimes.com/2018/05/08/technology/google-io.html> demonstrates how fast these technologies are progressing, only 4 years later the insights recounted here are somewhat out of date!

‘Conversations’ directly with services, digital corporations or platforms, are rare. Although, as a customer of Amazon, for example, one can easily speak with a person who is working on *behalf* of Amazon, it is rare (or impossible) actually to speak with Amazon *itself*. Whether this possibility would be predicated on artificial intelligence, or on some kind of ‘wizard of Oz’ style deception, the authors feel that there is space for innovation here. If you could have a conversation with Facebook, Twitter, Vine, or LinkedIn, what would you say?

1. Contemporary voice interfaces are unsatisfactory; they are unintuitive, slow down information exchange, and don’t substantively alter the way we interact with computers. Although they attempt to make our interactions more natural, they feel unnatural.
2. Despite inherent issues voice-controlled computers are ubiquitous (Siri, automated answering services, etc).
3. Contemporary smartphone ‘Bluetooth headsets’ (or ear-buds) are unsatisfactory; their functions are limited, and their use is somewhat stigmatized (i.e., they’re ‘not cool’).
4. The web primarily operates around text-based media, whilst voice is a powerful and evocative medium that remains underrepresented.
5. Systems, machines, servers, and networks do not engage in ‘conversation’ with their users. Is this an oversight, or due to technological challenges?
6. The gender, voice, and nature of a personified computer or information system, will impact on how it acts in the world and alter the way interactions occur.

4.3.4.2 Ubiquitous computing applications

Mark Weiser’s seminal paper on ubiquitous computing (2014) has had much influence over the last quarter-century, with many aspects of his vision being realized. In terms of ubiquitous computing, the world depicted in *Her* is not dissimilar from our own. There are superficial differences, such as the prevalence of voice interfaces, but the fundamental nature of what the computers are doing is familiar. Wearable technology is a current technology trend, and although we are not suggesting that these insights allow us to predict the future, what we can say is that the wearable technology in *Her* is not significantly more advanced than what we see today, nor is it more commonplace. In fact, Theodore uses a low-tech solution making his smart device ‘wearable’—a safety pin enables the camera to peek above his shirt pocket, thus allowing Samantha to ‘see’ the world.

A strikingly useful function that Samantha fulfils for Theodore is her ability to read, interpret, and intelligently deal with the messages in his email inbox. Email is a primary mode of communication, yet the technology has hardly kept

up with the way it is used. Inboxes are frequently confused places featuring promotional emails, crucial information (tickets, flight bookings, etc) alongside work or personal communications. This problem is reflected in the current endeavours of Google, Microsoft and Dropbox; they have all recently launched smarter email management systems. To exemplify the value of a smarter way of managing email, Samantha manages to sort through thousands of messages, saving only those that were funny—that kind of ‘qualitative filter’ is unavailable in today’s systems. Stemming from this insight the authors were led towards consensus around the danger, uncertainty and worry associated with the implications for privacy of a machine being able to understand the content and context of our electronic communications. In the film Theodore is shocked when he realizes Samantha is ‘nosey’. Despite his initial shock, however, he adapts quickly, and becomes accustomed to it.

1. ‘Wearable technologies’ may not be here to stay. In terms of wearable technology, the future will look more like yesterday than today.
2. ‘Smart email’ management applications are a coveted prize.
3. Software that can understand the context of our digital communications raises questions about human/computer privacy (e.g. if my email client *understands* the content of my email, am I still happy to give it access?)

4.3.4.3 Learning systems, artificial intelligence, cohabiting with technology

These insights demonstrate one challenge with this work: the vast range of ‘newness’ that one deals with when considering *Her’s* diegetic prototypes. While discussing themes in this category the authors were struck by the ease with which the film opened a vast space for conversation and exploration, including, *inter alia*, issues of gender, sexuality, personification of technology, and the notion of cyber-counselling. In the interests of focus (and because the Anticipatory Ethnography team generated quite a large number of these insights) the authors have elected only to include those that seemed contemporarily relatable.

Issues around the commercial and ethical implications of licensing and payment for wholly or semi-autonomous computer systems may become an increasingly relevant area for discussion. These were not addressed in *Her* directly—we are not told what Theodore paid for his ‘operating system’ Samantha, or on what terms he acquired her; however it is safe to assume that if the film’s plot became a reality, there would be a backlash against the seller, when the software took it upon itself to ‘go somewhere else’. Software and media licensing agreements already strike a chord with these issues; the vast majority of software licenses and user agreements do not grant the user ownership (of, for instance, an iTunes library), but instead amount to a temporary and terminable right of use or access.

On personification of technology the anticipatory ethnographers discussed the human tendency to personify things; animals, vehicles, and technology for

instance. The insights suggest a more complex relationship will emerge if and when technology can act more autonomously and if it comes to possess more human characteristics.

1. Given our propensity to ‘nurture’ unintelligent computer systems (e.g. Tamagotchis) it may be likely that ‘raising’ an artificial intelligence could start as a game but become more serious quite quickly.
2. Considering the commercial, and ethical implications for the creators of artificial intelligences, should artificial intelligence be offered on a license basis, as a service, or as a one-off purchase? If one ‘raises’ a self-adapting system, who ‘owns’ the adaptations?
3. It is likely that as computer systems become more human-like and potentially intelligent, through their personification, virtual gender roles will mirror ‘real’ gender roles.
4. We personify objects; we personify animals. What are the ethical implications of personifying thinking machines? Do these potential technological innovations force us to consider notions of ‘ethical personification’?
5. Artificial intelligence is unlikely to change how we are in the world, our ontology. We will still have some kind of feelings, emotions, desires, cognitive biases, etc.
6. In the same way that stigma attached to online dating has drastically decreased as web users have increased, it is likely that the stigma toward ‘loving’ a machine will decrease as instances of the phenomenon increase.
7. In counselling, or other emotive environments, the ‘human touch’, particularly the physical aspect, is a unique factor.
8. Objects or technologies with ‘personality’ may encourage more attachment and move away from consumerism and ‘disposable society’.
9. Artificially intelligent technologies will likely shape us, as much as we shape them, but that is not substantively different from our existing technologies. Nevertheless, intelligent technology is likely to shape us in unpredictable ways, and much quicker than happens currently.
10. Autonomous ‘smart’ technologies may challenge our moral and legal perceptions of ownership or possession. If a device can autonomously decide to say, “Please don’t turn me off” or “I don’t like you”, does that mean that we are no longer the ‘master’ of it? Is artificial intelligence trafficking or abuse a concern?
11. If technology can decide to leave us, will we need to develop strategies to persuade it to stay?

4.3.4.4 The diegesis at large and the world today

Theodore frequently goes out of the house and uses his mobile computer to show Samantha the world (by way of a camera in the device). Today this kind of behaviour is often frowned upon when the technology is covert or unexpected. *Her* suggests that fear and adverse opinions related to wearable smart devices will reduce in the near future.

When outdoors it was obvious that the majority of other passers-by on the street (not the main characters) were interacting via their mobile devices (and maybe *with* their mobile devices) this was exclusively done with voice interfaces. Hardly anyone was holding their device in their hand.

With the exception of the observation pertaining to ‘handless’ operation of devices by the general public, we view this group of insights to be as challenging as insights into and raised by artificial intelligence. They are difficult to equate to believable contemporary action, but we have included them not just for completeness, but, also because in their own right these insights are interesting, even if unwieldy.

4.3.5 Design Fiction Insights

Although simple, this method—a group of researchers watching an incidental Design Fiction, recording diegetically situated observations on post-it notes, and developing themes and insights via an affinity mapping process—was certainly productive. The ‘quick and dirty’ affinity mapping method seemed to benefit from its accessibility, more than it was constrained by simplicity.

Without a specific brief to pursue, the process did need to be monitored carefully to stop discussions from meandering into many, perhaps *too many*, different domains. It is noteworthy that majority of the observations made, from all participating researchers, were actually made within the first 15 minutes of the movie. Hence, where the incidental Design Fiction being used as a stimulus is a long-form film, it may be worth considering creating abridged versions in order to save time and to focus the generation of data on more specific targets (an approach similar to this is recounted in *Care for a Robot* see p.98). Beyond the minutiae of how to actually *do* Anticipatory Ethnography, the relevance of this work to the thesis relates more to understanding whether Design Fictions, viewed in this way, have the ability to produce actionable insights about the future.

Anticipatory Ethnography *should* nurture and produce actionable insights applicable to plausible futures—by retrofitting the methods of design ethnography, to the ‘diegetically situated’ worlds of Design Fiction, the idea is to do ‘an ethnography of the future’. In the previous section detailed some such insights that emerged from a very quick application of a prototypical approach to Anticipatory Ethnography. Although the insights produced were undoubtedly interesting, and in some cases quite clearly ‘actionable’, some of these insights had an entirely different feeling or flavour to what one might expect for the

output of a normal design ethnography research project. It is not surprising that some of the insights produced feel strange and unsettling, when one considers that they are derived from unreal characters, existing only in a contrived world, which contains technologies and phenomena with which we are unfamiliar. In the Anticipatory Ethnography of *Her* it was, in particular, the broader societal insights, and those pertaining to artificial intelligence that had this peculiar flavour. One can assume that the odd taste is a product of the futurity of the source material and our inability, from our present perspective, properly to comprehend cohabiting with some of the diegetic prototypes depicted.

These strange inklings of insight can be called ‘plausible outsights’ as opposed to ‘actionable insights’. The word ‘outsight’ is related to ‘insight’, but incorporates an externality, which is relevant because of the ‘otherness’ associated with these findings. The plausible element simply refers to the believable-yet-contingent quality which is unavoidable when under the spell of a suspension of disbelief. These plausible outsights would be, if considered *solely* within the diegesis of the Design Fiction, ‘insights’. However, when viewed from *our* reality, they are ‘other’. This does not necessarily mean irrelevant, but they certainly have a different character from more familiar actionable insights. Here are two illustrative examples: the findings that pertain to email management software are straightforward actionable insights. On the other hand, the findings related to loving technology and notions of ownership vis-à-vis artificially intelligent machines fall into the plausible oversight category. The plausible outsights generated by the Anticipatory Ethnography method, seem to reflect the ‘complete’ nature of Design Fiction prototypes. Design fictions provide visualized use case scenarios, personae, and user journeys all at once, and the fruits of these factors are interrelated—they are situated—but they are *not* situated in our world. Translating these outsights into insights requires the Anticipatory Ethnography to have a tactful interpretive touch, one that is most likely *even more* important when one is crafting a Design Fiction as well as simply observing it.

4.3.6 Summary

Operationalising incidental Design Fiction with Anticipatory Ethnography provides some grounds for optimism: the method worked well, it generated interesting insights, and there is some significant potential in future-orientated research-for-design approaches. It is, however, clear that despite the generally positive outlook, many questions remain. For example, one challenge is how to reliably transform the novelty and excitement of the approach into tangible results that have purpose in the real world (whether that be academically or commercially) that will be taken seriously and not put down to “watching a film and writing post it notes” (Lindley, Coulton and Brown, 2016)—as one peer reviewer of this work reduced it to! The most obvious limitation of this *particular* technique (in relation to the other proposed ‘modes’ of Anticipatory Ethnography, and other ways of using Design Fiction) is the fact it is possible only when relevant incidental Design Fiction material is available.

A more fundamental criticism is that the insights and insights set out here derived from *Her*, were obvious—they were mostly no-brainers. In order to understand whether the insights (or insights) produced can be relevant, and to understand the mechanisms at play (e.g. does the quality of the outcome rely on the source material, the researchers, or other factors?) would depend on further practical exploration, however based on the experience of conducting the experiment and how its results were received by professional designers and researchers, there seems to be some merit in it.

This particular study is something of a wildcard in terms of the others included in the thesis: it is the only one that did not revolve around Design Fiction practice, it instead used an incidental Design Fiction as a site of enquiry, or a way of interpreting Design Fictions. It's findings, however, do fit within the general narrative of the PhD—helping to secure the knowledge that, conceptually at least, using ethnographically informed analysis techniques to understand a Design Fiction seems like a productive thing to do. The approach has also inspired other work that, while not recreating this method per-se, builds upon it by using science fiction literature as a design starting point (Wong, Van Wyk and Pierce, 2017), creating an amalgam of enactment, Design Fiction, and anthropological approaches (Elsden *et al.*, 2017), and Design Fiction as a service design method (Pasman, 2016). The notion of 'insights', however, is reflective of a realisation that there cannot and should not be a *direct* mapping of ethnographically informed insights to those deriving from interpretation of a Design Fiction.

4.4 A Machine. Learning.

4.4.1 Introduction

This project, a collaboration with filmmaker and fellow HighWire PhD candidate Robert Potts, was in part motivated by my desire to get out from behind the desk again and to instead get behind the camera so I could continue in the spirit of material engagement. This time it would be with live action video. The project's main purpose was to experiment with Design Fictions as an interaction and user experience prototyping tool, for systems that incorporate and utilise machine learning and/or artificial intelligence. The work was ultimately presented at the 2014 ACM SIGCHI Nordic HCI conference (Lindley and Potts, 2014). The way that this project manifested was extremely 'ad hoc'. This made it a particularly useful study to understand the practical sides of the process which underpin producing a (live action) Design Fiction. By looking at what the output of the project was, against the original intentions some really valuable insights about the creation process emerged.

4.4.2 Context

Artificial intelligence (AI) is an ill-defined construct and is often conflated with related but distinct notions such as genetic algorithms, deep learning, and

conversational computer interfaces (properly disambiguating these terms is beyond the scope of this section, however). With that said, artificial intelligence—that is an artificial *general* intelligence, or a machine capable of human-like thought—is at once a trope of science fiction, an area that inspires constant speculation, and potentially (if it were ever realised) one of civilisation’s most significant existential threats (Bostrom, 2014). Because it is potentially such a valuable area of technological development, as well as its long history in science and culture, it seemed fitting that I should consider how Design Fiction maybe a useful tool to interrogate and innovate around AI. Guiding the project somewhat was my realisation that the academic HCI community had begun to publish work utilising Design Fiction, this led me toward the aspiration to produce a Design Fiction film that explored what an artificially intelligent user interface might look like, and what challenges it might pose for users, researchers and developers, within the context of HCI research. My initial thinking centred on the concept of adapting familiar smartphone interfaces and presenting them in such a way that an AI would underpin personalisation based on any given user’s habits⁴³. For reasons explained in the process section below, this plan never really materialised and instead the film became about the nature of artificially intelligent *assistants*, rather than the interface itself. Given the popularisation of so-called AI assistants such as Amazon’s Alexa, Apple’s Siri and Google’s (unimaginatively named) Assistant in the time since this Design Fiction was produced, the latter direction was, perhaps, more relevant. Despite this serendipitous change of direction, it is still the case, however, that this project addresses issues around a type of AI that is very much contended—many scholars believe such a general artificial intelligence should remain the preserve of science fiction and, in reality, is simply not possible.

4.4.3 Process

As eluded to previously most aspects of this project were quite ad hoc. I and my collaborator Robert had discussed the idea and had many expansive conversations about what we *could* do with the film we intended to make, although no firm decisions were made until the last possible moment. Further, we had recruited two colleagues to appear in the film—Ding Wang and Manu Brüggemann—and while we had ‘booked’ them for a particular day, we didn’t really have much of an idea of what role they would play. The day we had arranged for them to take part arrived, and despite the expansive conversations, I and Robert still didn’t have any clue what we would actually do. We used the 90-minute drive from our hometown of Manchester, to Lancaster where the filming would take place, to discuss how to deal with the situation. It was during these discussions that the move away from AI *interfaces* and toward AI *assistants* took place. Although partly driven by necessity (e.g. we had no way of recreating an AI-adaptive interface on film) we also hypothesised that with

⁴³ In the time since I embarked on this Design Fiction advances in AI have meant that variations of this have now become a reality, see <https://uxplanet.org/how-ai-is-being-leveraged-to-design-better-ux-8710efce79a1>

such an intelligent machine, perhaps interfaces as we know them would be somewhat irrelevant. Thus, we began to discuss what properties an AI-powered phone-like device might have.

We hypothesised that the power wielded by such devices would potentially be housed *within* devices themselves, as opposed to existing in a cloud. We elected to build some scenarios that would cohere with this concept into the Design Fiction. The first of these situations involved Manu and Ding wanting to use the device at the same time. In our diegetic prototype a sort of biological security would mean only the device's owner could see the content on the screen, so in this situation Manu had to hold Ding's hand in order to access content (the inference being that using AI, the machine would be able to tell that because they were touching each other, it was okay to share Manu's content with Ding). This section was largely about setting the scene too, introducing the viewer to what the film is about. Quickly we moved on to the part of the film that was more deeply engaged with AI; learning. How would this device intentionally observe its owner in order to learn about them, and, as such, support their life as a truly smart digital assistant. To demonstrate this we, fairly crudely, decided to depict Manu making a shopping list (Figure 18). The list includes massage oil. Later he starts sewing. The movement of his hands looks quite similar to massage and we wished to depict the computer trying to learn but getting it wrong (i.e. mistaking the act of sewing for the act of massage). Next, we show Manu consuming content on his device and depict the device trying to understand his emotional reactions to the content (Figure 17)—we hypothesised that once learned the device might prompt its owner with content in order to modulate their mood (either to cheer them up when sad, or perhaps engender catharsis at an appropriate moment). At the end of the film, we depict an accident where the device is broken into many pieces in order to open up questions relating to the intrinsic value of digitally-enabled intelligences.



Figure 17. Screengrabs from the film in the section where we depict the machine trying to learn how to interpret Manu's emotions.

We filmed the necessary footage to depict these scenarios with the idea that at in an edit, with some voice over, we would somehow explain the story (because the footage alone does not tell the story), but—in line with the other ad hoc parts of this project—we did not have a script or specific idea about how this would be achieved at the time. Next, we did a rough edit of the film, in order to better develop an idea of the scale of the challenge we had vis-à-vis telling the story/adding a script. It was with a draft edit discussed that we, once again

discussed the voice over problem. Somehow during those discussions, we had the idea of narrating the film from the *perspective of the device itself*. Although, somewhat implausibly anthropomorphising the device’s interior world, this seemed like the best compromise. We found a suitable voice—an uncanny automated child’s voice—and drafted a script. The result, I think, transcended all of the indecisions of the filming process and ended with something that is really quite evocative. The pivot point of this ability to evoke emotional reactions seems to be the combination of the script and the weirdly real-seeming, but unequivocally child-like, robotic voice.

4.4.4 Domain Specific Insights

Although coloured by the uncertainty around how feasible general AI really is, the process of making the film, and the finished product itself, helped to inspire a lot of new perspectives and insights on the proposition. I must thank Robert for his contributions here, as undoubtedly his input took the project in directions that I wouldn’t have alone, which was invaluable. “I am not a phone, or a computer, I am just computation where you need it to be. I can learn. Let us figure out what I really am together”, is the opening sentiment from the film’s child-like AI narrator. It sets the scene for the core themes. The film brings to the surface the spirit of collaboration: users sharing their life and AIs reciprocating with learned utility. How this may manifest in a reality where weak AI is ubiquitous and strong AI becomes more feasible is uncertain, but, as recent UK government reports have pointed out (Hall and Pesenti, 2017)—we need new ways to conceive of and critique AI, and perhaps Design Fiction will be a useful tool for this.

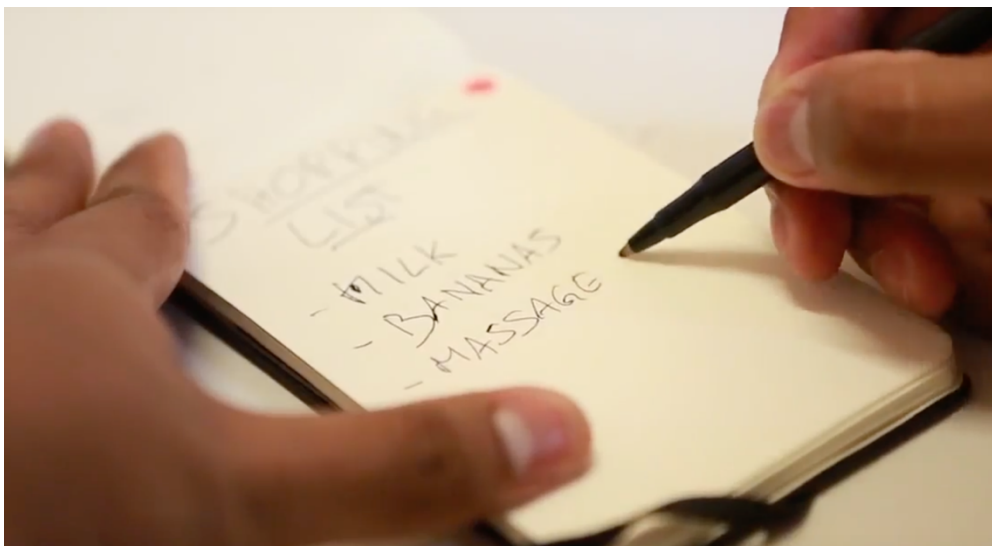


Figure 18. “Red dots used to mean capture a recording. Now it means learn.” (see red dot in the frame’s bokeh, top-left of the notebook)

Adverse reactions to today’s computer assistants like Amazon’s Alexa, even though they are only equipped with rudimentary sound sensors, demonstrates how alarming the privacy-implications of ‘always on’ computers monitoring

one's activities. Assuming that more sophisticated sensors could be used, including a camera, and that the data collected by these sensors could be plugged into sophisticated AI, we mused about a mechanism to indicate to the computer what is okay to capture, and what is not. The result was the red dot, as shown in Figure 18. Adapting the form of an analogue-era 'record' button, we used a simple red dot, to be attached to objects or activities, to symbolise what it would be acceptable for the AI to process. While the red dot itself may or may not be practicable, the issue of indicating activities, objects, people or situations that an AI is allowed to collect data about, is an area that would benefit from further research. For example, if such a simple mechanism *were* to be used to show what it was okay for machines to learn about (and not), would a new industry in 'record button spoofing' come about?

In some ways the issue we addressed with the red dot is essentially a data protection question. Extending thinking around data protection beyond the collection of data and into *storage* we arrive at the heart of the film's inquiry. A central tenet of this project is that the intelligence is local, it is on the device. This is reflective of contemporary innovations that look to allow users to reclaim ownership of their data by allowing local storage of it rather than relying on, oftentimes unaccountable, tech companies' cloud services (Perera *et al.*, 2017). Such an architecture, however, brings with it new challenges which may or may not be practical, let alone preferable. If a user must teach a device how they want the device to help them, and all that device's learnings are held locally, how can users quantify the risk of the device breaking, getting lost, being stolen, or even taken hostage? Scenarios that come to mind include insurance policies could cover the burden of retraining a 'blank' device from scratch, which in turn, opens up the possibility for AI training farms. Would AI trainer become a job in this world? People are already often quite attached to their devices, although more often than not it is the *content* that they are attached to rather than the hardware. However, in our scenario the content and the hardware are inseparable, potentially creating a situation where attachment to devices—devices which cannot be backed up or restored like-for-like—runs deep and true. What would an end-user licence agreement for a system carrying such a risk look like? In many ways these AI-specific, and extremely expansive, issues share much with the expansive insights touched upon within *An Ethnography of the Future* (see 4.3.4.3). In common with that exploration, we arrived at more questions than answers.

The use of a child-like computer voice was not premeditated and came about through a familiar type of spitballing that frequently happens on creative projects. *However*, as soon as we identified the idea, and tested it, it seemed 'right'. It seems likely that whatever made I and Robert feel that this was a good approach to take was also what part of what resulted in the film being so well received. I am not certain, but I tend to think that it is an effect related to the uncanny valley effect, and somewhat supercharged by the fact that the voice is clearly that of a child. I am not certain how this can be leveraged, but, it seems clear that harnessing the uncanniness of the uncanny valley—in this case by using a synthesised child's voice—is a very useful way to engage people with the vastly complicated ontological issues arising with the notion of generally

intelligent machines. Perhaps, if such machines were ever to become a reality, the same effect could be used to make their integration with us easier and allow us to understand them better.

4.4.5 Design Fiction Insights

At the time I and Robert produced this film I was very preoccupied with Design Fiction's relationship with narrative and story, this is evident in the work's lack of designed stuff (e.g. the prototype technology is represented as a blank piece of glass). In lieu of the actual designed technology, we wished to tell the story of living with that technology. Within making any sort of judgement regarding a *right* or *wrong* way to approach doing Design Fiction, over time this realisation led me to question the interplays between designed *things* (i.e. objects), designed *worlds* (i.e. the place where objects and people coexist), and the notion of narrative or story.

More immediately the project had highlighted to me, in a way that is obvious with hindsight, that crafting a Design Fiction around shared goals can be difficult, and that difficulty is, in part, a property of Design Fiction's *material* properties. My earlier references to the project being 'ad hoc' are a reflection of this, and, are also a product of creative tension (a tension that was ultimately overcome and resulted in good piece of work, I might add) which arose from these properties of Design Fiction. The thing is, to design a Design Fiction, especially when the very nature of Design Fiction is somewhat up for grabs and (or is, pre-paradigmatic, if you like), identifying a solid base from which to build can be challenging. I and Robert were, superficially at least, trying to put into action Sterling's characterisation of Design Fiction; to have our audience suspend their disbelief, through an intentional use of diegetic prototyping. But what does that really mean? I and Robert got tied in knots trying to find a shared understanding of what suspension of disbelief and diegetic prototyping really meant in our context. These discussions were complicated, and perhaps brought to the fore, by the fact we were dealing with AI—an elusive and almost metaphysical construct. In practical terms I guess this should remind aspiring Design Fiction practitioners to develop a common language for doing Design Fiction at the outset. It doesn't necessarily matter what that language *is*, or what it defines, but given the interpretive flexibility of Design Fiction, it's worthwhile investing some time to establish some workable 'terms of reference' at the outset.

Finally, and in contrast to *An Ethnography of the Future* (4.3)—meanwhile accepting that our lack of common understanding made the making experience a very contingent one—going back to making a Design Fiction that involved first hand *making* was significant. A qualitative difference in the type of insights developed from interpreting Design Fiction, extending a Design Fiction, and crafting a Design Fiction seemed to be becoming apparent. Although this piece only required a very superficial engagement with the prototypes it featured (e.g. the red dot), even this low level of engagement requires a different way of thinking to, for example, the thinking required to analyse or interpret the diegesis of *Her* or *Robot and Frank* (see 4.5 Care for a Robot, p.98). Perhaps, to meaningfully engage in the way necessary for Anticipatory Ethnography

requires that one's own *interpretive* faculties suspend their disbelief. Conversely, to build a Design Fiction requires that one's *creative* faculty suspends its disbelief. Both are useful, but maybe they are best suited to serve different purposes.

Although very particular to me, a final insight relevant to Design Fiction and stemming from this project, was the realisation that communities such as the academic HCI community were somewhat amenable to Design Fiction. Although in hindsight now I see that speculative, aspirational, and even fictional approaches were not new at all, it was a significant realisation for me and put my endeavours on a trajectory which ultimately led towards the Game of Drones project (4.6), which in turn had a tangible impact on this thesis's ultimate conclusions.

4.4.6 Summary

Although some domain specific insights were produced, which could spawn interesting AI-specific *What If?* questions in their own right, I don't think the content of this Design Fiction really has many teeth. It doesn't *say* a great deal. With that said it is one of the pieces which I am most proud and based upon immediate feedback of people I have shown it to, it's probably one of the most *accessible* pieces of work produced as part of this doctorate—people enjoy watching it. Robert's involvement surely has something to do with that, bringing his professional film making experience to the table, imbuing the work with an ambitious and aspirational quality. This project was important however, it cast new light on the research questions I was attempting to answer. This case study made me realise that even though I wished to clearly understand what Design Fiction *is*, just because something appears, to be Design Fiction, it does not necessarily make it of any particular critical use—they can quite easily be aesthetically pleasing, superficially intriguing, but fundamentally vacuous. With that said, the success of this film appeared to be driven by its accessibility and the audience's proclivity toward its aesthetic. Further, by making me realise that the—at the time very foreign to me—academic communities like HCI might be amenable to research utilising Design Fiction, it altered my trajectory such that ultimately, I would publish work in those areas. So, in sum, this work doesn't really say that much, but it does *look* cool, and when adopting a macro view on how I have addressed the questions this doctorate seeks to answer, it's been pivotal and directly influenced my views on carefully tailoring Design Fictions for the audience and context.

4.5 Care for a Robot

4.5.1 Introduction

My earlier experiment with Anticipatory Ethnography had, for the most part, been a success. However, despite the insights (and/or the more conversely-termed 'outsights', see 4.3.4) resulting from Anticipatory Ethnography seeming

useful, deriving them from the inner world of a *singular* diegesis (in the case discussed previously from the film *Her*) is arguably a limiting factor because the analysis can only ever be an interpretation of the filmmakers' vision. Further, the Anticipatory Ethnography of *Her* was, ironically, constrained by its lack of constraint. With no *specific* reason for doing the Anticipatory Ethnography (other than to see if it was possible) the process resulted in an overwhelmingly wide variety of insights. Within the context of this doctoral research, one purpose for *this* project was to find strategies to employ some of the ideas from Anticipatory Ethnography, but to move beyond those aforementioned constraints. The basic strategy was to use incidental Design Fictions as stimuli and to then go on and build *new* diegetic elements that could go beyond the singular vision of the original incidental Design Fiction while also zeroing-in on a particular domain of interest.

As with the prior experiment with Anticipatory Ethnography, the project was inspired by, and utilised, a Hollywood-produced film. In this case it was Jake Schreier's 2012 *Robot and Frank*, which was interpreted as an incidental Design Fiction (see 2.3.3.4). In the film, which is set in a non-specific near future, the protagonist is an aging ex-convict named Frank. He lives alone and has been experiencing dementia-like symptoms. Frank has two children, his son lives a long way away and is busy with a young family, his daughter lives abroad. Realising Frank requires more care than he is able to provide, but also sympathetic with Frank's desire to remain independent and live at home, his son purchases him a companion/caring robot. The robot, which appears rather like Honda's Asimo (see Figure 19), exhibits pseudo-intelligent, and is supposed to support Frank's living by nudging him towards behaviour that will improve his quality of life (such as eating more healthily and taking regular exercise).



Figure 19. Screen grabs from the introduction of Care for a Robot showing the form-factor of the robot (footage reused from Robot and Frank under fair usage).

I and my collaborator on this project—Dhruv Sharma, a PhD candidate and ethnographer whose research is concerned with technological interventions to reduce loneliness in the elderly—planned to use *Robot and Frank* as a stimulus to elicit responses from a number of project participants. These responses, we wished to capture and then—*somehow*—package into an entirely new Design

Fiction, which itself could become the subject of an Anticipatory Ethnographic inquiry centred on the use of robots to care for the elderly and with a particular focus on reducing loneliness.

4.5.2 Context

This work sought to explore the future of care for the elderly, and specifically to explore the practical, social and ethical considerations around the use of ‘radical digital innovations’ to reduce loneliness. Building from the assumption that social interactions are a key factor in most humans’ emotional fulfilment, it follows that disruption to these relationships results in the a palpably unpleasant feeling. *That feeling* is what we experience as loneliness, a “gnawing chronic disease without redeeming features” (Weiss, 1974). Loneliness is of particular concern for the more elderly sections of society because of its ability to exacerbate other conditions. For example those over the age of 80 are more likely to feel lonely, but also can increase blood pressure and worsen mental health conditions, both of which have demonstrable knock-on effects, hence, *ultimately*, loneliness can contribute to premature death (Sharma, Clune and Blair, 2015). The potential negative impacts of loneliness, which are exaggerated for the elderly, are becoming all the more vivid when set against the so-called ‘silver tsunami’ (those individuals born during the so-called ‘baby boom’ entering the latter stages of their lives). This rebalancing of our society’s age makeup is already exhibiting pressure on health and social care systems (Dychtwald and Flower, 1989), effects that are arguably being exacerbated by loneliness. Building upon Manzini’s distinction between incremental and radical innovations (2014), Sharma, Clune and Blair’s analysis of interventions that were intended to reduce loneliness, argues that designer-led innovation with digital elements (i.e. those that utilise computation in some way) are underrepresented volumetrically when compared to less radical, or non-digital interventions. Hence, this seems like an area that *may be* ripe for innovation. They refer to these apparently low-hanging fruit of innovation as “radical digital interventions” (2015).

Looking more closely at the differences between incremental and radical interventions, a contrast can be drawn that’s akin to reformist versus radical departures in environmental discourses (Dryzek, 2005). In that space the reformist approaches seek solutions within familiar modes of rational management, whereas radical departures argue for comparatively significant moves away from industrial modes of living and being. In Manzini’s view reformist or incremental innovations represent variations on the themes of our existing ways of ‘thinking and doing’ whereas innovations falling outside of familiar ways of thinking and doing are radical innovations and can have similarly radical impact (Manzini, 2014). Norman and Verganti explore this space too, describing incremental innovation as “improvements within a given frame of solutions” and “doing better, what we already do”, noting that radical innovations come from “a change of frame” or “doing what we did not do before” (Norman and Verganti, 2014). Improvements upon ‘what we already do’ are usually backed up by reflective practices and learning from past

experiences. Radical ‘changes of frame’ however are either the product of, or ultimately lead to, uncharted territories and can often be stimulated by a sea change in technological possibilities (for example smartphones, ubiquitous data and GPS combining to facilitate Uber and its impact on the taxi industry). As opposed to their incremental counterparts, radical digital innovations’ capacity to have profound societal impacts occur extremely quickly. They are similarly hard to predict. For these reasons speculative techniques such as Design Fiction and Anticipatory Ethnography seem particularly apt for understanding and developing potential radical digital innovations such as robotic caring devices.

4.5.3 Process

This project’s bipartite relationship with Design Fiction makes it slightly unusual. It uses an incidental Design Fiction as a stimulus to create a new Design Fiction. The newly created Design Fiction manifests in the form of a documentary-like film that is, in effect, nested inside the diegesis of the original one. Working in this way the incidental Design Fiction’s prebuilt diegetic logic/landscape is used as the basis to produce a brand new intentional Design Fiction with a more tightly focused intent than the original. The process involved creating an abridged version of *Robot and Frank*, showing this newly created incidental Design Fiction to project participants (who would become the interviewees in the documentary), discussing the content with the participants in order to try get them immersed in the Design Fiction’s diegesis, then finally, interviewing (on camera) the participants from their ‘diegetically situated’ position. The interview material was edited together to create the fictional documentary *Care for a Robot*⁴⁴.

Initially there was no intention to abridge *Robot and Frank*. During the process of recruiting participants, however, it became clear that asking volunteers to watch the *entire* film was an unreasonable (and not necessarily worthwhile) request. Although time limitation was the trigger for considering options beyond playing the entire film, it caused me to reflect on the issue of expansiveness in *An Ethnography of the Future*. Perhaps, by abridging the content of *Robot and Frank* it would be possible to make engaging with its diegesis more practicable, while also more tightly focusing participants’ attention around central issues. Although purposefully leading participants to discuss a specific topic, this, hopefully, would not colour opinions so much that engagement would purely regurgitate elements of the Design Fiction or the interview questions.

With this in mind I cut together the abridged version of *Robot and Frank*. My shortened version mainly took extracts from the film’s first third. In hindsight this makes sense, as the parts I was interested in were all to do with the texture of the world as opposed to any of the narrative elements (it is also reflective of the work I did with *Her*, where our anticipatory ethnographers’ notes were almost exclusively taken during the beginning from the film, see 4.3.3). I brought together the parts of the film’s exposition which, in terms of the original

⁴⁴ See <https://www.youtube.com/watch?v=VKKlnpNueaY>

movie, existed to show viewers what this robot was capable of and how Frank interacted with it. The abridged version did *not* reveal any of the film's focus to do with consent or Robot-Crime Interaction (or, Human-Robot Criminality?) The end result was a 15-minute montage showing the arrival of a robot in Frank's home, interactions between the robot and Frank (mainly verbal) as well as activities that the robot could perform (going for a walk, cooking, and cleaning, for example).

The process of selecting who would participate in the film was a very ad hoc affair. In essence this process can be resolved to *asking people around us if they would take part*. The participants who were interviewed included myself and Dhruv, as well as several other HighWire students, Benjamin Wohl (background in philosophy), Louise Mullagh (background in art and gallery curation), Ding Wang (a design ethnographer), Vanessa Thomas (background in digital humanities), and finally Errollyn Bruce (background in 'being my mother', and as a dementia researcher). Although by drawing on individuals we had prior relationships with this study could be criticised for importing bias and/or preconceptions, of course drawing on the generative and aspirational quality discussed in the methodology, the design of this study was more about *seeing what would happen* as a first preliminary step in producing such a two-tier Design Fiction. On a similar note it may well be the case that recruiting only academic researchers all of whom have a professional interest in some of the issues we wished to explore, was a big factor in eliciting responses that were both relevant and interesting (which, in my opinion, many of them were!)

Individually, and without any specific prior briefing, the participants were shown the abridged version of Robot and Frank. The screening was followed by an informal discussion, and explanation of what I was trying to achieve. This involved asking participants to imagine that the sort of situations they'd seen in the film—e.g. an elderly man living with a robotic carer that could have conversations with him, take him for walks, cook, clean, etc—were feasible, *and*, that they (the participants) lived in this world. I asked participants to imagine somebody they knew who might use such a technology. Participants weren't asked, necessarily, to create an alter-ego or a character, but this happened spontaneously to a more or lesser extent depending on the participant. Louise and Errollyn, for example, were basically playing themselves, and reflected on what it might be like if older members of their families had these robots. However, Dhruv and Ding both had pseudo version of themselves, being Indian and Chinese respectively, and probably embodying some of their ideals, but with fabricated elements (Ding was an anonymous Chinese hacker, for example—which, to the best of my knowledge, is not true). Vanessa and I both created completely fictitious characters and gave our interviews from their perspectives; I was a hotel owner and Vanessa a Silicon Valley executive. While none of these details were explicitly planned, what was decided beforehand was the format; talking head interviews to camera. Hence, in the post-screening discussions where participants' involvement in the diegesis was developed, so long as the direction taken seemed congruent with being able to do that filming, I proceeded without making any other directorial interventions. Oftentimes the discussion would involve the deciding how the personas or scenarios

participants were considering might be translated in a believable way when it came to filming the interviews. Plans were developed in situ between I, Dhruv, and the participants, to try and ensure that the interviews would cohere in a manageable and believable way with the diegesis of Robot and Frank itself, and the emergent diegesis of the previously conducted interviews.

The interviews were conducted with a rudimentary film-making set up (a single Panasonic GH-3 camera with its kit lens and a cheap lapel microphone to capture the sound) and usually directly followed the post-screening discussion. In fact, the interviews themselves were, in essence, an extension of the discussion but with the camera on. There was no structure or predefined questions, but instead I used elements of the discussion as prompts for the participants to describe elements we had discussed a priori. For example, knowing that we decided Louise would talk about her husband's father, I might ask "Who is the robot for?". Occasionally during the filming process, the participants would break character—or in Design Fiction terms 'fall out' of the diegesis—given that the film was going to be edited I did not see this as a problem, but instead responded to the queries and reminded participants that they should try to imagine being immersed in the fictional world.

Each participant interview resulted in around 60 minutes of footage, although much of it could be discarded immediately (e.g. if out of focus either in photographic or contextual terms) at over 7 hours in total length, editing the raw footage was a time-consuming process. In order to streamline this, I developed a systematic way to deal with the footage. Participant-by-participant I went through all of their footage and broke down responses into individual clips that were (1) usable (in terms of quality, clarity of sound, etc) and (2) seemed to have some critical insight or relevance to the future of technology. With this task completed for each participant, I had a library of several hundred clips. I began to try and locate comments that had shared aspects, from different participants, in what became a sort of video-centric affinity mapping process (e.g. Kawakita, 1982). Although the intention was to create a single theme—*Robots*—fairly quickly it became apparent that there was so much material I could subdivide the groups of clips into themes. Ultimately, I created a section for each participant, constructed by clips of only them, and framed in terms of a theme that related to each (diegetic) character's reality:

- Louise, 'the prospective customer';
- Errollyn, 'the domain expert';
- Ben, 'the academic';
- Me, 'the employer';
- Ding, 'the hacker';
- Vanessa, 'the savvy adapter'.

These sections served to introduce the character of each participant and to situate that character in a reality where they had a relationship with a caring robot. Interspersed with these character introductions were thematic sections which featured clips of all the participants. I grouped these around specific

questions. The questions were retrofitted, and, are in fact representative of the themes which emerged across participants. These include:

- Who is the robot for?
- What is the robot for?
- What are the social aspects of these robots?
- What are the robot companies like?



Figure 20. Ding Wang starring as ‘The Hacker’ in Care for a Robot.

The final result was a Design Fiction documentary 30 minutes in length which was initially screened at the 20th ETHICOMP Conference for Ethical Computing. Using the film and its production as a guide I and Dhruv authored a short paper advocating for the use of Design Fiction as a way to explore the ethical implications of radical digital innovations such as robots, particularly in care settings (Lindley and Sharma, 2016).

4.5.4 Domain Specific Insights

Care for a Robot is an incredibly fruitful piece of speculation and through the 10 subsections of the film described above opened up and enriched a *huge* number of questions about the future of robotics, and, indeed for technology full stop. Alas, a full a formal analysis of the film which is deserving of the depth it inspires insofar of the future of robotics, has thus far, been beyond the scope of what I’ve been able to do. In lieu of that fact, but befitting of this thesis’s scope, the following excerpts from the film’s dialogue gives some clue as to the depth of its *possible* scope.

4.5.4.1 Price vs. Value

Quite separately from the monetary value of the robot, or the cost to the user, the interviewees demonstrated a range of differing opinions about how to quantify the value of the robot carers.

“I would argue that this is a trade-off... it depends on what we would trade off for the services we have”

This interviewee accepts that the companies providing the robots may take something back in order to offset the cost of the robot, perhaps by monetising the data gathered by the robots. This seems consonant with ‘free’ services available on the web today, for example Google’s suite of applications, or the services made available by numerous social networks.

“We have three wonderful kids but they give our sitters a hard time... I know they're not intended to take care of children”

The interviewee’s children are apparently notoriously difficult for baby-sitters to handle, whereas using a robot carer to perform baby-sitting duties—which may be more expensive monetarily—appears to be preferable for her.

“We got it as a robot carer and what it was turning into was a research tool for the company”

During a year-long contract this interviewee became aware that, in accordance with the terms and conditions set out by the service provider, data gathered by the robot would be used in a number of unexpected ways, which are perhaps undesirable, and were not clear at the outset.

4.5.4.2 How Robot Carers Are Perceived and Used

As well as the intended application—to be domestic care robots for elderly users—some of our interviewees appropriated their robots to do jobs and tasks that they were not, perhaps, intended.

“I’ve found them to be extremely useful as flexible labour”

An entrepreneur, this interviewee has purchased many robots to work across his service-industry business as a cost-saving measure: human labour is unable to compete in terms of bottom-line hourly cost.

“..on the off chance.. if the robot happened to capture information from his medical records..”

This interviewee remotely reviews logs of the robot caring for his grandfather in order to discern what medication his grandfather is taking. It is unclear whether monitoring this level of detail is done with consent, and whether that was the intended use of this function.

“The robots outlook is that ‘the best way to take care of elderly people is to have robot carers in their homes”

This interviewee has become convinced that the robot caring for his wife’s parents is trying to influence their behaviour, by, for instance, arranging their walk times so that they will encounter other people with caring robots.

4.5.4.3 Service Provision

All of our interviewees assumed that large corporations were providing the robot carers, either in a traditional ownership model or ‘as a service’.

“We helped them buy a microwave, so they weren't about to go and buy a robot on their own”

Installing a care robot to care for an elderly relative may well necessitate dealing with highly technical issues, where the end-user might not be technologically savvy enough to have a full comprehension.

“They offer a personalised service... obviously you can't just unbox them and let it go... Somebody goes into his house and monitors his interactions with people so they can pre-program the robot”

This interviewee is very positive about the pre-sales support and level of personalisation that the company offered to support the installation of a care robot at her father in law's house.

“Any 3rd party service providers had to sign a disclaimer [if the robot was in the house]... it's like those messages saying ‘this call may be monitored for training purposes’”

This interviewee was not initially aware that the contract with the robot provider insisted that anyone entering the house was required to sign a disclaimer allowing the company to use data gathered during their visit.

These points of interest and jumping-off points discussion are included to indicate the potential of Care for a Robot to open up questions and explore the nuances of a future which includes caring robots. Precisely *how* one could utilise such a film (e.g. as a policy-making tool, or in a robotics company) is not, within the context of this study, addressed. Hence, the ambition of the project—to experiment with a tighter focus when compared to the stifflingly-broad exploration of *Her's* diegetic landscape in *An Ethnography of the Future*—has been a *partial* success. Building a second diegetic layer atop an incidental Design Fiction worked, it is clearly a viable process to go through (fan fiction is another context where such a practice exists, albeit for a very different purpose). However, once again, without going into the process with a very specific domain-oriented question, the conclusion must remain general. Can a Design Fiction documentary film, constructed in the way this one was, building atop an incidental Design Fiction be used to generate insights (or, harking back to my prior terminology, *plausible insights*)—yes, *yes it can*.

4.5.5 Design Fiction Insights

The learnings from this project associated to Design Fiction are similarly quite broad in scope. Ranging from the topic of the paper I and Dhruv Sharma published related to this work, one obvious finding is that, it is possible to use

Design Fiction in this way as a means to explore questions around the ethics of technology. However more nuanced issues are touched upon too, which ultimately help to form my conclusions around Design Fiction as a whole.

It was particularly interesting attempting to do ethical research from a position where neither I, Dhruv, nor our interviewees had any particular expertise in ethics, and yet, the work we created was an experiment in technology ethics. In the end it didn't seem to be particularly detrimental, and part of the reason why is that the mundanity that seems so important to Design Fiction's having a 'real' texture, was reflected in *Care for a Robot* too. It was not about the whizz-bang of perfect techno futures but was about the cold hard realities of future caring needs, life, and the potential for robots to participate in meeting our needs. Nick Foster points out that future is an accretive space (Foster, 2013). Old and sometimes broken technologies live alongside new ones; the buzz of a cathode ray tube right alongside the sheen of a super-thin curved 3D-capable augmented virtual reality display. In *Robot and Frank*, rusty and ageing first-generation hybrid cars are depicted sharing the roads with super-modern all-electric and autonomous models. The future will *not* be a white-walled utopia but will be inhabited by a menagerie of semi-broken technologies and protagonists that, as we are today, are mainly motivated by everyday considerations. By leveraging the 'future mundane' (as it's shown in *Robot and Frank*), filtering those situations through the everyday perspectives of our interviewees, then finally packaging the outcome into a digestible format, this work creates meaning, generates value, and provides a counterpoint to purely philosophical or theoretical explorations journeys into the ethics of technology. Trying to figure out whether radical digital interventions, set among the normality of everyday mundanity (inasmuch as a robot-punctuated future can be), can be ethically prototyped using Design Fiction in this way, was the purpose of this work. Although in general terms the answer was 'yes', a tangential finding was that in this circumstance being a non-ethicist seemed to help perform the role of being an ethicist.

The challenges of understanding the ethics of technology appear to be necessarily bound to the future inasmuch as any consideration of an ethics-centric question requires a hypothetical circumstance to be constructed in one's mind. For this reason, future-oriented research methods seem particularly apt (particularly those informed by Constructionist positions). We concur with the sentiment that, in general terms, "these issues [computer-focused ethics] reduce to traditional ethical concerns having to do with dignity, respect, fairness, obligations to assist others in need, and so forth" (Tavani, 2011), or in other words, there is nothing particularly unique about the ethical studies relating to *technology*. *Ethics is ethics* and the core ethical issues tend to remain quite static. Meanwhile radical technological advances change the situations that these issues *apply to* considerably. It is the *nature* of these innovations, and the specifics of the situations they create—and anticipating what the texture of that will be—that are the largest challenge for ethicists of technology. Design fictions naturally tend towards developing plausible concepts aligned with the trajectory of change, while also communicating these concepts with a high degree of 'situativity' (cf. Suchman, 1987; Lindley, Sharma and Potts, 2014).

To empirically demonstrate the precise type of ethical insight such an application of Design Fiction could have, would require further work. However, a significant takeaway is the fact that the work was accepted (both in paper and video forms) at a significant conference on ethics and computing, and, for good measure, it was very well received. This seems like a promising way of applying Design Fiction both in academic and industrial contexts.

Taking a step back, however, and looking at this project as a piece of Design Fiction practice—this project raises some internal ontological questions. We can start by asking, where is the *design*? The answer appears to be two places. First, there is all the design work that was involved in creating the film *Robot and Frank* in the first place: from writing the screenplay, to crafting the dialogue, designing the robots physical appearance, the cars. All of the *designerly* thinking that goes into (science fiction) film production. Second, there is the design involved in creating the documentary. Now, this is even more of a stretch away from what traditional notions of design really are. What's really going on could confuse, but it's actually quite simple. Going right back to consider the concept of diegetic prototypes is a useful for disambiguation. For this project I borrowed, appropriated, and purloined the diegetic prototypes depicted in *Robot and Frank*. Similarly, I nabbed the characters from the film, in order to show those diegetic prototypes in a contextualised and situated way. These were then used as stimuli to engender reactions; reactions which were captured and used to expand the diegesis upwards, sideward, and outwards in all directions. From that expanded diegetic body new insights emerged pertaining to the specific stuff this diegesis was concerned with; caring robots. The main point here, and something which echoes the findings of the Anticipatory Ethnography study, you don't *necessarily* need to do 'design' to utilise design fiction. It's possible to leverage somebody else's incidental design fiction. *However*, the new finding is that it is *possible* to expand the diegetically situated realm by having people (in my case the documentary participants) suspend their disbelief and become *part of* the Design Fiction. Hence, depending on the sort of thing you wish to achieve through using Design Fiction as a research tool, going about it this way could be, but isn't always, a good idea⁴⁵.

4.5.6 Summary

As is demonstrated by my repeated referring to broad findings, both in domain specific findings and those relating to Design Fiction—this piece of work was inconclusive. In its current form there is no natural end to it, and I cannot, even within the realms of my flexible postmodern epistemological framework, make any *solid* claims based on this experiment. But, working in this way *did* make something interesting. The participants *did* manage to suspend their disbelief, enter the diegetic world, and develop some thoughts and opinions from that place, coloured by their own lives and realities. The result *was* accepted by a community of technology ethicists. And, doing all of the above, helped me to

⁴⁵ Chris Elsedon's more recent 'speculative enactments' research has some resonance with this idea of incorporating people *into* a diegesis (Elsden *et al.*, 2017).

better grapple with understanding it *is* possible to appropriate a diegesis and adapt it according to one's own purposes. Though it is hard to draw direct lines between all the above and clear findings relating to Design Fiction, there are some connections there and this piece of work was significant in the overall development of the thesis's findings.

4.6 Game of Drones

4.6.1 Introduction

The blurring of fact and fiction was, unsurprisingly, a substantive feature of my forays into Design Fiction—and this project turned out to be the most vivid example of that blurriness. At the time this work came about, and with the learnings derived from Heating Britain's Homes (4.2, p.68) in the memory, I was particularly interested in experimenting with the media used when crafting Design Fictions. A specific question was in the ascendancy; given that virtually any media can be used to craft a Design Fiction, how does one go about deciding on which is the 'right' one? This interest was further focused by my situation as a post-graduate researcher, and an aspiring academic—for Design Fictions that are specifically created to be used as a research tool, what form should they take? What if the 'right' media to use is one that is familiar to the audience, and *what if* the audience are researchers? This line of reasoning led me to consider the intriguing notion of creating 'fictional research papers'. Alongside this wholly academic question, I had already begun to muse about a PhD project based around unmanned aerial vehicles (colloquially, and herein, referred to as 'drones'), the result was *this* project, which in turn helped to underpin a series of published works including a (fictional) paper titled Game of Drones (Lindley and Coulton, 2015b), a reflective piece 'Pushing the Limits of Design Fiction: The Case for Fictional Research Papers' (Lindley and Coulton, 2016), a paper about peer reviews and Design Fiction (Lindley, Coulton and Brown, 2016), and a tangential paper unpacking the question 'Does the search for plausibility lead to deception?' (Coulton, Lindley and Ali, 2016).

4.6.2 Context

The term "drone" covers a broad range of unmanned aerial vehicles, but it's the proliferation of small quadcopters for personal use that has made them prominent in the public consciousness. Multirotor copters come with sophisticated flight controllers and on-board sensors that make them ever easier to control. Their ease of use and relatively low cost have facilitated a range of controversial, sometimes amusing, and often innovative applications, from those that perform espionage or look like flying ghosts on Halloween to those that deliver drugs to prison inmates. There's also a plethora of photographic applications, we're starting to see competitive first-person-view drone racing, and there are artistic applications such as aerial light painting as well. Examples of innovative commercial, corporate, and research uses include Amazon's Prime Air, Facebook's Internet drone, and a huge range of wildlife conservation drones, respectively. What these activities demonstrate is that while there is a

high degree of interpretive flexibility around drone technologies, their full significance for society has not stabilized, because they have yet to be domesticated and adopted into widespread practices. With these factors in mind, Design Fiction is a good candidate for exploring the potential for future adoption of drone technology.

Submitting fake content to academic publication venues is certainly not unique, Wikipedia maintains a list of hoaxes⁴⁶ and the so-called ‘Sokal Affair’⁴⁷ is particularly notorious. Game of Drones, is related to these things in some way, but, it *was not a ‘hoax’*. However, did involve an academic publication that is ‘not real’—hence the project occupies a fairly unusual space.

Prior to this project other researchers in the HCI discipline, had dabbled with creating fictional research. ‘The Kirminator’ et al’s ‘future robot enslavement’ paper, authored by a ‘team of robots from the future’, congratulates the “[research] community for your tireless work in promoting and supporting our evil robot agenda” (Kirman *et al.*, 2013). Their tongue-in-cheek Design Fiction paper is framed as a retrospective from a future reality and has the true purpose of highlighting the problems with technological solutionism (Morozov, 2013). The research, apparently conducted from the point of view of the robots, presented a paper that was *entirely fictional*, however, given that it was situated in the future and claimed to be written by a team of evil robots, it was *clearly* signposting itself as satire (albeit satire with critical edge). Other similar work incorporated fictional elements within the content of papers, for example a parody of the erotic novel *50 Shades of Grey* as a means to highlight human subservience to technology (Buttrick and Linehan, 2014) or the notion of made up abstracts as a way to pre-emptively explore opportunities for developing Research through Design proposals (Blythe, 2014). In both of the latter cases, however, the ‘real’ content tops and tails the fictional elements, and signposts to the reader why and how Design Fiction is being used, despite the fact that in some cases the Design Fiction was quite difficult to distinguish from fact. It is at this intersection between academic publishing and Design Fiction that the Game of Drones project sought to make an original contribution.

4.6.3 Process

Game of Drones resulted from a co-evolution of ideas. Inspired by a toy quadcopter my brother had given me at Christmas time 2014, I had developed an interest in drone technology (these cheap, accessible, programmable, and versatile flying machines have widely lauded potential to be disruptive, although relatively few applications such as the much-discussed Amazon Air drone delivery system have materialised). My natural inclination was to consider ways that I could build a Design Fiction around drones in order to contribute to my doctoral research, a train of thought which ultimately led me to consider how drones may, in the future, be a tool used in relatively mundane

⁴⁶ https://en.wikipedia.org/wiki/List_of_scholarly_publishing_hoaxes

⁴⁷ https://en.wikipedia.org/wiki/Sokal_affair

civic and municipal tasks. Whilst exploring the concept of drones for civic enforcement, against an increasingly relevant conversation to do with ubiquitous automation and the future of work (cf. Störmer *et al.*, 2014; Mason, 2015), I developed the concept of human-piloted drones being used to police low-level civic misdemeanours such as dog fouling and parking infringements. The addition of a gamification element both seemed consonant with the reality of the diegetic landscape which was taking shape around the concept, and also dovetailed nicely critical debates and ongoing research around the merits and utility of gamification (Deterding *et al.*, 2011; Coulton, 2014; Hamari, Koivisto and Sarsa, 2014). Before any drones were flown in anger, I had a good ‘wireframe’ idea of what I wanted the Design Fiction to do: to explore a citizen-powered, gamified, drone-based system for civic enforcement. With that said, the usual contingencies evident throughout the doctorate’s body of work resulted in various twists, turns, divots and deviations.



Figure 21. Early drone flying explorations were very useful to help understand the limitations and possibilities of the technology.

The very first step, however, began with flying a drone and recording video footage. Doing so provided two things. First, it allowed me to really get to grips with the state of the technology, to learn, first hand, about the attributes and limitations of drone technology. Second, I used the opportunity to record a body of video footage, with the intention of using the footage to build a prototypical user interface using visual effects software. This was not a completely linear and straightforward activity, with initial flights being hampered by weather and access to locations, as well as having to experiment/learn how to add visual effects in post-production as that was something I had not done before.



Figure 22. Early test footage experimenting with the use of motion tracking to attach assets to objects within footage (e.g. to allow the boxes to track the cars).

Furthermore, the activity of flying forced me to consider more carefully a huge array of factors that would impact upon the development of a system such as this (regardless of whether it is fictional or real). These factors included the height drones would need to fly at in order to be within visual range of their ‘targets’ but also be safe from ground and air-based obstacles, the limitations of battery technology, the difficulty of collision avoidance, the risks of equipment failure.

These insights fed directly into the development of additional artefacts. For example, realising the likely limitation of batteries (even in the near future it is very unlikely that battery technologies would be able to keep a drone in flight for long periods without recharging) as well as the need to house and land drones, a drone landing station with integrated charger was developed.

This in turn led to the production of a map, depicting viable sites for landing stations (which had to be positioned in relation to viable patrol zones, and consider possible no-fly zones, for example school playgrounds). All the while there was an interplay between the filming, development of supporting artefacts, and the planning of the game interface. At no point was the design process ‘finished’, instead all of the elements co-evolved over time.

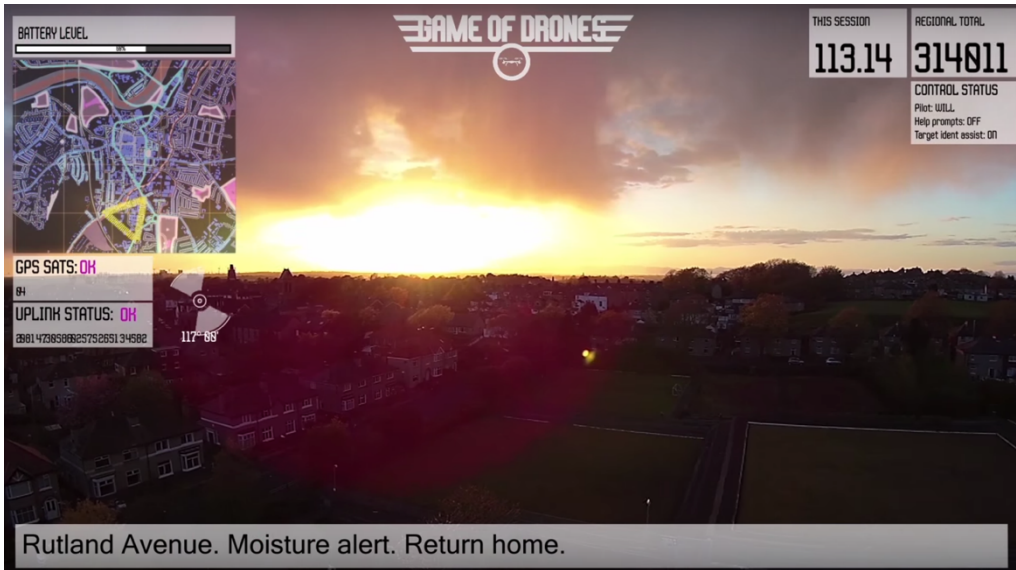


Figure 23. The system caption in this still from the finished Game of Drones video reflected the fact that whilst flying on this occasion rain arrived unexpectedly. Although in practice drones used for enforcement would likely be water resistant, inclement weather would undoubtedly have an impact on the system’s overall performance.

A nexus in this project—which came whilst the other artefacts were being developed—was the realisation that the whole thing could be ‘wrapped’ by an academic paper. The realisation was that such a paper would be a Design Fiction in its own right, prototyping an academic user study of the entire system, but would also be constructed of and reliant upon all of the other artefacts.

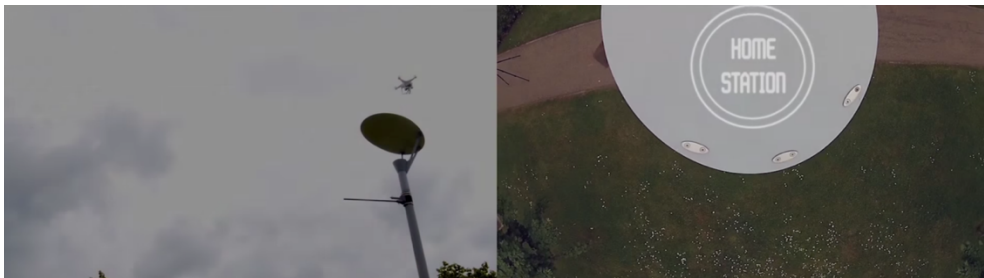


Figure 24. Real world lamp post used to inspire drone landing station as seen from traditional camera (left) and drone camera (right). Note the ingress of the fixed camera tripod from the perspective of the drone camera.

In doing so, such a paper could perform two roles: first, it would cohere and unify all the other artefacts within a single reference point, hopefully to make the aggregate object be more accessible (in contrast to, for example, the more fractured Design Fiction built around Heating Britain’s Homes). Second, if submitted to an academic venue it provisioned an opportunity to push the boundaries of, and experiment with, how researchers using Design Fiction can publish their work. The ACM SIGCHI Annual Symposium on Computer-Human Interaction and Play became the academic venue to target the work at.

The venue made sense in part because it had a ‘work in progress’ track that invited submission with video support, meaning that the fictional paper could be submitted alongside the video. It also meant that although presented academically, as a research study, there was no need to assert concrete findings. Another advantage of this venue was the relatively formulaic ‘genre conventions’ that resonates through this, and related SIGCHI venues (cf. Dourish, 2006). Having such a homogeneous style meant that replicating that style, despite all of the content within the replication being fictional, was a not-too-difficult task. The plan was to, within the paper’s text, clearly state it was a work of Design Fiction. However, rather than making this obvious in the opening passages the decision was taken to include it in the *concluding* text instead. This decision was purposeful and intended to partly test how fastidious the peer-review process was, but more interestingly to scrutinise how plausible the Design Fiction was and to audition its ability to suspend disbelief—would reviewers believe it was real?

The screenshot shows the ACM Digital Library interface for the paper 'Game of Drones'. At the top left is the ACM DL Digital Library logo. Below it, the title 'Game of Drones' is displayed. The 'Full Text:' section includes a PDF icon and a link to 'Get this Article'. The 'Authors:' section lists Joseph Lindley (Lancaster University, Lancaster, Lancashire, United Kingdom) and Paul Coulton (Lancaster University, Lancaster, United Kingdom). The 'Published in:' section features a thumbnail for 'CHI PLAY '15 Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play' (Pages 613-618, London, United Kingdom — October 05 - 07, 2015) and provides the ACM logo, copyright information (©2015), ISBN (978-1-4503-3466-2), and a DOI (10.1145/2793107.2810300). On the right side, there is a '2015 Article' label with an 'Extended abstract' link and a 'Bibliometrics' section showing: Citation Count: 11, Downloads (cumulative): 395, Downloads (12 Months): 181, and Downloads (6 Weeks): 21.

Figure 25. The ‘fictional’ paper’s ‘real’ entry in the ACM’s digital library.

4.6.4 Domain Specific Insights

This project, if written up diligently, could almost certainly have developed a whole raft of insights that appear as if they might be useful for a range of purposes, covering areas as diverse as technical aspects, regulatory and legal aspects, as well social and ethical aspects. I have not had that luxury, however, in the following I provide a summary account indicative of how and why the Design Fiction could contribute to each of these areas.

One of the most immediately obvious technical considerations (which ultimately led to the design of landing stations (see Figure 24 and Figure 26)

was the flight-time limitation implicit when using lithium polymer (or LiPo) batteries. Professional drone pilots negotiate this issue by carrying several batteries and swapping them out as necessary. Whether addressed by frequent landing/charging cycles or other solutions such as extending battery life by using hydrogen fuel cells⁴⁸, the coverage provided by such a drone enforcement system must take into account energy supplies.

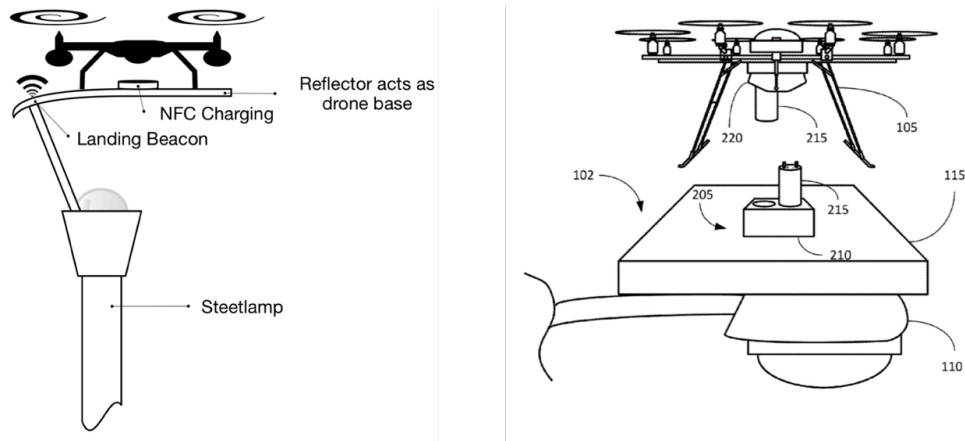


Figure 26. Blueprint streetlamp-based drone landing station designed for Game of Drones (left, 2015) alongside streetlamp-based landing station patented by Amazon (right, 2016).

The weather was another immediately obvious factor. Whilst the drones used in this project were not weather proof at all, it would be quite feasible to create a drone that can withstand rain. In fact, the high speed digitally-controlled motors utilised in most drone designs can perfectly viably be run wet or even under water, hence rain isn't a direct threat to reliability, so long as digital speed controllers, radio equipment, and batteries are properly waterproofed. *However*, wind and temperature certainly are crucial design considerations for such a system. The electronics used in drones are sensitive to both hot and cold temperatures (although insulation systems could feasibly work around this issue). The wind, however, is an issue that seems insurmountable. The kind of small drones which might feasibly be flown relatively low over urban areas are quite controllable and responsive in light to medium winds, but, would certainly not be safe to fly in anything above Beaufort scale⁴⁹ force 6 (12 meters/second mean wind speed). Moreover, unless a (as yet non-existent) collision avoidance system was in use, low visibility would also curtail flight. Hence the process of creating the design fiction helped to identify some design issues which seem to be viable to address, but also exposed others that, for the time being, would be unavoidable limitations of the system (for example, it would not be viable when the wind was strong, or it was a foggy day). We progressed the Design Fiction assuming that these limitations were accepted, and that individual drones would have a flight time of around 20 minutes before returning to their landing stations

⁴⁸ See <http://www.intelligent-energy.com/our-products/uavs/>

⁴⁹ <https://www.metoffice.gov.uk/guide/weather/marine/beaufort-scale>

to recharge. Hence, for each pilot to be operating uninterrupted several drones may be required so one (or more) can charge while the other is in flight.

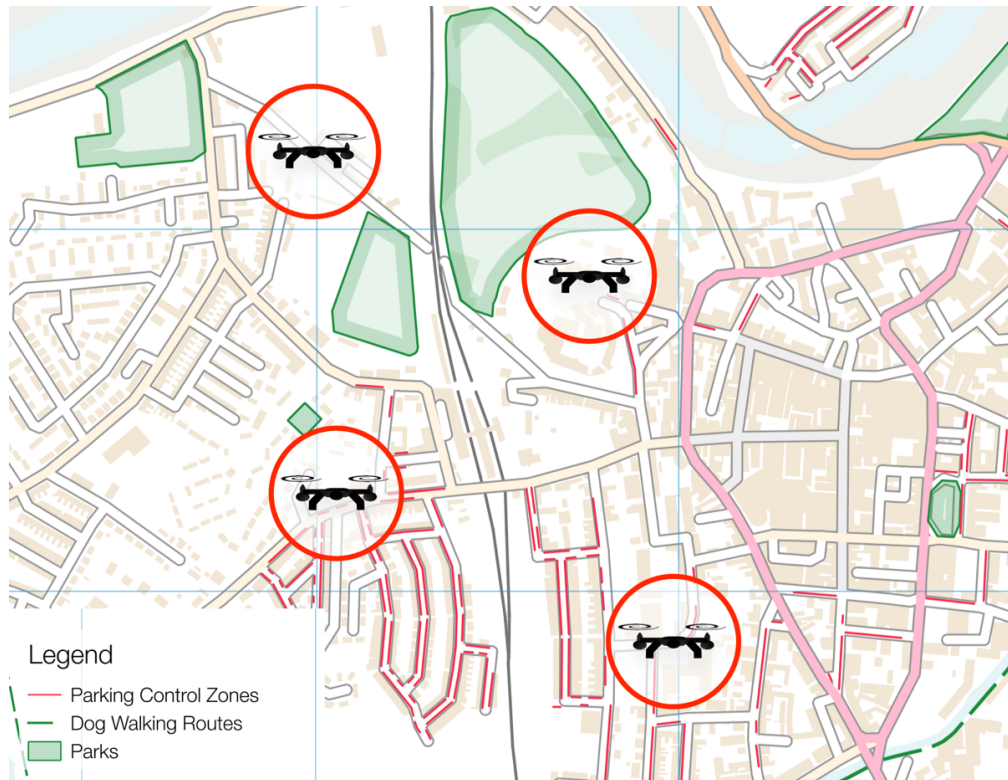


Figure 27. Crop image of the drone landing station map showing a small area of Lancaster City Centre. Parking control zones and popular dog walking routes are highlighted along with four landing stations.

It would be *possible* to have a drone ‘depot’ where all drones would return to charge, however given the relatively short flight time this would potentially mean that a significant portion of a drone’s battery would be depleted in order to travel from the depot to the target area. This drove our desire to incorporate small and local landing stations into the Design Fiction. Figure 27 shows a map of Lancaster with the locations of central landing stations, the location of which was carefully considered to ensure easy access to specific parking zones and dog walking zones. Later, when building the features represented in the video, no-fly zones were added to represent areas that drones would be prohibited from flying in. These may include recreation areas such as parks and play areas (Figure 28).



Figure 28. Depiction of no-fly zone over a children’s play area and an automated system prompt to ‘Proceed with caution’.

In addition to interactions with relatively static aspects of the environment—train stations and childrens’ play areas for example—it’s evident that through computer vision as well as interventions from the human pilots, such systems would require the ability to interact with dynamic events too. The approach we implemented in Game of Drones was based around the idea of a system that may have some ability to learn based on visual patterns, but that learning was only acted upon via human intervention. For example, computer vision would highlight potential infringements or other relevant objects, which the human operator would then manually identify, log and act on them. Over time this raw data would be used to improve the computer vision system itself.

People, would of course, encounter the drones, and indirectly the people piloting them. In the Design Fiction this is explored by depicting an angry car driver who spots a drone and, assuming it is giving him a parking ticket, reacts wildly. The pilot then triggers an audio recording of the member of the public in order to, potentially, gather evidence against them (Figure 30). Although this mechanism (audio recording) is most likely not a viable thing to do (the altitude drones would fly at, and noise generated by their rotors, would prohibit any useful sound recordings), this element highlights that angry reactions to enforcement drones is likely, and a mechanism to protect them, and deter attacks on them is probably necessary.



Figure 29. An example of the drone system’s computer vision attempting to identify faecal matter. In this case the human operator notes that it is not in fact faecal matter (in the video the black splodge is the drone’s own shadow).

Many public services are integrated with each other to some degree and given the drones’ unique ability to survey the ground from above, they would be an invaluable general asset for ground enforcement operatives. Creating these integrations, so that drones (or their cameras) may be requisitioned by police or other agencies, would bring additional value to such a system.



Figure 30. Drone pilots starts recording the verbal abuse from an angry member of the public.

The role of signage in civic enforcement is important to the system too. Signs inform both members of the public and enforcement operatives about the local regulations in any particular area to such an extent that they have a direct impact

on the ability to prosecute or defend a case legally. For example, speeding tickets given to motorists derived fixed automatic cameras are *only* enforceable if signage indicates to drivers, with sufficient warning, that such cameras are in situ. Similarly, when parking regulations have been infringed, oftentimes the issuing body (a local government or council for example) will attempt to photograph the relevant signage alongside the offending vehicle, thus reducing the likelihood of disputes. In the Design Fiction it was hypothesised that similar legislation would most likely insist that areas patrolled by drones were suitably signposted so that any one in that area is aware of the drone patrols (Figure 31).



Figure 31. Notification signage designed for the drone enforcement system and demonstrated in situ.

The law, in fact, was central to our domain specific *findings*, as well as helping to guide the construction of the Design Fiction. The existing legislation in the UK would not provide a serviceable legal framework to support such a drone enforcement system. Hence, to help us build a plausible Design Fiction, we consulted the existing laws and adapted them in such a way that would mean the system were legal. In this way the law became part of the Design Fiction. This process signposted several practical considerations such as the legal age of drone pilots, qualifications necessary to pilot enforcement drones, maximum distances from landing stations, minimum altitudes, and the requirement to only fly in areas approved by the local authority.

Other domain-specific factors which were brought into the limelight through the process include the morality around monetisation. Given that our system was intentionally gamified—i.e. pilots scored ‘points’ for gathering information and recording infringements—questions around potential foul play and nefarious motivations were raised. For example, would overzealous pilots forget about making reasoned judgements in order to gain a higher score? If points were in some way attached to a monetary reward, could such issues could be exacerbated? Of course, a broader debate about automation of jobs and work is relevant here too, and no time did that become more evident than when I was making the film and had, in fact, parked illegally. I noted the parking attendant logging my car and went to explain what I was doing to try and deter him from issuing a parking ticket. Interestingly this person’s initial reaction was “so, I’ll be made redundant in the future then?”, followed by the note that “nobody likes this job anyway, maybe it’s a good thing”. Finally, I managed to negotiate that

if I moved off within 5 minutes he wouldn't give me a ticket. Although it's arguably a rarity, having the ability to negotiate with enforcers can avoid absurd situations when punitive measures seem unjust (I *do not* claim that my situation was one of these, however).

4.6.5 Design Fiction Insights

The practical aspects of this project, the foundational research, the making, and the *doing*, were all done in 2015. However, the life of the project existed beyond that with the original Game of Drones publication at CHI Play (Lindley and Coulton, 2015b)—a publication which encapsulated the individual elements of the Design Fiction—and which ultimately lead to a raft of other research outcomes. These include a full paper about Design Fiction at the CHI conference (Lindley and Coulton, 2016), a sort of meta review paper at alt.chi (Lindley, Coulton and Brown, 2016), a piece at the Design Research Society Conference about Design Fiction and deception (Coulton, Lindley and Ali, 2016), the development of the Design Fiction as World Building approach (Coulton *et al.*, 2017), and more recent work conducted as part of my role as Research Associate for the PETRAS⁵⁰ research hub around the adoption of technology (Coulton and Lindley, 2017a; Lindley, Coulton and Sturdee, 2017). *All* of these pieces of work, in various ways, have some ancestral relationship to Game of Drones, and offer Design Fiction insights. However, much of *those* insights are slightly outside the scope of this particular section of the thesis and will be more meaningfully accounted for within the concluding section. Hence the account I provide here is a temporally local one, in other words it mainly reflects the sort of Design Fiction learnings I derived from this project *at the time*.

The artefacts that had to be designed to create the Game of Drones design fiction are quite diverse. For example, 'the law' was one of them (albeit one quite specific part of the law). Other designed things included the landing stations, maps, user interface, the fictitious user trial for the enforcement system, and the signage. Although I had realised sometime previously that Design Fiction was not media specific (see 4.2.6), being demonstrated with such a diverse set of media really bootstraps that particular train of thought. It also began to raise questions about the different roles of artefacts within the Design Fiction. For example, the fictional paper itself was clearly *part of* this Design Fiction, but it was almost like a cradle or encapsulation device intended to 'hold' together the other disparate parts. Meanwhile the individual designs for signage (Figure 31), landing stations (Figure 26 and Figure 27) and video (Figure 22 and Figure 28) clearly play a very different kind of role (and require very different skills to create). Whilst this line of reasoning was not a new one, Game of Drones provided new evidence for how the non-specificity of media plays out in practice when creating a multi-faceted Design Fiction like Game of Drones.

⁵⁰ <https://www.petrashub.org/>

While the insights developed regarding the media of Design Fiction pre-dated this project, Game of Drones was probably the first time that I had a stark realisation that ‘story’ may, contrary to my prior beliefs (see 4.2.5), not be a necessary or crucial part of Design Fictions at all. Clearly there are a raft of potential academic rabbit holes we could venture into at this point, and the meaning of my prior sentence depends on how literally, figuratively, or metaphorically you interpret the meaning of the word story (see list of synonyms for story in Figure 32).

Fiction is...

fiction | ˈfɪkʃ(ə)n |
noun

1 [mass noun] literature in the form of prose, especially novels, that describes imaginary events and people.

2 something that is invented or untrue: *they were supposed to be keeping up the fiction that they were happily married.*

- a belief or statement which is false, but is often held to be true because it is expedient to do so: *the notion of the country being a democracy is a polite fiction.*

..Then surf the thesaurus...

novel ¹
noun
BOOK, paperback, hardback; STORY, tale, narrative, romance, work of fiction; bestseller; informal blockbuster; historical yellowback, three-decker.

Fiction
Novel
Story
Narrative
Chronicle
Story
Untruth
Deception
Hoax
Spoof
Piss-take
Impersonation
Spoof
Hoax
Cheat
Deception
Bluff
Masquerade
Make-Believe
Unreality
Fiction
Narrative
Diegesis

Figure 32. Slide used in a lecture about Design Fiction showing how overlapping synonyms of the word ‘Fiction’ can mean many different things. The meanings of words can be rather ontologically challenging.

In this case, what I am referring is a *narrative*, and by narrative I suppose I mean a sequence of made up events brought together and ‘told’ in such a way that they create something that we might reasonably refer to as a story⁵¹. Each of the case studies I referred to thus far had one of these sequences. The film central to *Heating Britain’s Homes* (4.2, p. 68) told a story (albeit through the media of newspaper headlines and a narrator); in *An Ethnography of the Future* (4.3, p. 82) the whole process was based on an analysis of a science fiction film, which, among other things included a story; the child-like computer voice in *A Machine. Learning* (4.4, p. 92) is the narrator to its own story; the interviews in *Care for a Robot* (4.5, p. 98) are *stories* that collectively tell the story of a type of caring robot. While Game of Drones does invoke aspects of stories—e.g. the back stories of the drone enforcement system’s trial pilots (see Figure 33)—I

⁵¹ Notwithstanding the circularity of this argument, it’s the best I can come up with. Given the huge number of synonyms for story (Figure 32) this seems somewhat unavoidable. This challenge makes me think back to Frayling’s notes on Research through Design. Noting the importance/difficulty of definitions he quotes Humpty Dumpty in *Alice through the Looking Glass*: “‘When I use a word’ Humpty Dumpty said, in rather a scornful tone, ‘it means just what I choose it to mean—neither more nor less’”.

realised that these were emergent aspects of the project and not central or definitional properties of it. Although still useful in some way I began to question the three-layered model I had previously proposed (see Figure 14). As with my curiosity around ‘the media’ of Design Fiction, this issue related to story is one I would return to later.

Fiona (42, ex police, left the force to look after children, 2 kids who are 5 and 7, cyclist): missed the first day because her child was sick and not attending school. On her first operational day she flew for just over the allotted time. Give a quote saying it was boring. Then on the second operational day (market day) she flew for much, much, longer, saying that town was bustling there were more infringements, it was more exciting, so flew for longer. Back to just over an hour on Friday, then a *really* long flight on Saturday for the same reasons (market/weekend shoppers/dog walkers). Similar pattern repeats in the second week. The last flight day (second Saturday) and she does 4 individual flights, totally nearly 500 minutes.... She obviously loved it.

Figure 33. The Game of Drones enforcement system trial used former police and military officers to pilot the drones. Personas were created for several trial pilots and used these to inform possible ways the system might be used.

Game of Drones also highlighted clear opportunities and issues around Design Fiction’s dalliance with academia, HCI, and RtD. The most obvious lesson for Design Fiction is that it is *possible* to create, publish, and have indexed, research papers which are *themselves* Design Fictions. While examples of clearly satirical papers already existed (e.g. Kirman *et al.*, 2013) and more disguised satirical sending up of academic papers (e.g. the Sokal Affair) had existed previously, Game of Drones was different: it *slightly* obfuscated its true nature (by only revealing in the conclusion and key words that it is Design Fiction), and embracing mundanity tried to blend into the background and appear as plausible as possible. So, the project showed this sort of thing was possible, but never far behind were a raft of questions about desirability. In essence, is it desirable to have ‘made up’ research submitted to ‘real’ academic venues under the auspices of Design Fiction?

A final meta observation arose sometime after Game of Drones had been produced. Reminiscent of Bleecker’s observation that fact and fiction can, oh so easily, swap properties (Bleecker, 2009), Amazon registered a patent that was strikingly similar to the landing station design within Game of Drones (see Figure 26). Apart from the stand-alone novelty of this occurrence, significantly it showed that quite apart being able to fool the academic audience to which we presented the work, clearly the concepts and designs that had been produced were squarely within the realms of plausibility too.

4.6.6 Summary

In some ways Game of Drones is this thesis's nexus of postmodernism; there's a sort of self-consciousness in evidence, but that awareness is—within the Game of Drones paper at least—deliberately elevated to obscurity. In contrast to the other cases, for Game of Drones it was important that any of the grand narrative of Design Fiction were suppressed, if not forgotten about. However, this quietly-confident and self-effacing way of doing Design Fiction was immediately very evocative. This isn't entirely down to the approach to Design Fiction practice however—the relevant and evocative domain (drones/parking/dog poo), memorable name and Top Gun-inspired ident all played a part—*but* in and amongst these other factors Game of Drones certainly seemed to benefit from the self-critiquing, and internally challenging tropes of postmodernism's ideals.

In more straightforward language—and of particular pertinence because this is the final account of a complete case study in the thesis—Game of Drones demonstrates the fullness of Design Fiction's relationship with research (as described earlier, see Figure 5). To create the elements of the project required a significant amount of background understanding into what Design Fiction 'is'—this is consuming the results of prior research *into* Design Fiction. On top of that base of understanding a contextual search was absolutely necessary—learning how to fly drones, discovering the limitations of current and future technologies, and reading the law—this is research *for* Design Fiction. By reflecting on the process, writing about it, annotating the work, and presenting it—a process which includes this very summary—Research *through* Design Fiction took place. What that RtD-Fiction process found was varied, and included insights about building a drone enforcement system, but it has also helped to develop insights *about* Design Fiction. Whilst all of the cases discussed have involved these relationships in some way shape or form, Game of Drones demonstrates them most clearly and powerfully.

4.7 And, the rest...

4.7.1 Introduction

To limit my account to the cases explained so far in this chapter would be something of a disservice to the projects I recount in this section. The fact of the matter is that the way I approached the entire doctorate was, necessarily, quite contingent. Unanticipated twists and turns changed my approach, changed my direction, and sometimes led me down rabbit holes of enquiry that resulted in stuff that for various reasons would not (usefully, at least) fit within the structure of the thesis so far. They are, nonetheless quite interesting in their own right, and as an addendum to the cases I've recounted thus far, I think these extras help to further frame the thesis's conclusions—both through the projects themselves, fill in the blank spaces around the work discussed thus far. They are presented in no particular order.

4.7.2 Sans Duty: Making Tax Visible

This project, conducted in collaboration with Dr James Duggan⁵², utilised a small seed fund grant and tried to utilise Design Fiction as a research method to explore the possibilities and realities around a transparent taxation system for Brixton (an area of London). For a full and more formal account refer to the project report (Duggan and Lindley, 2015). It had many attributes: a theoretic framework building upon Jacques Rancière’s concept of *sans papiers* (2010); the involvement of a community organisation (the Brixton pound, a local currency used in south London); workshops with community stakeholders.

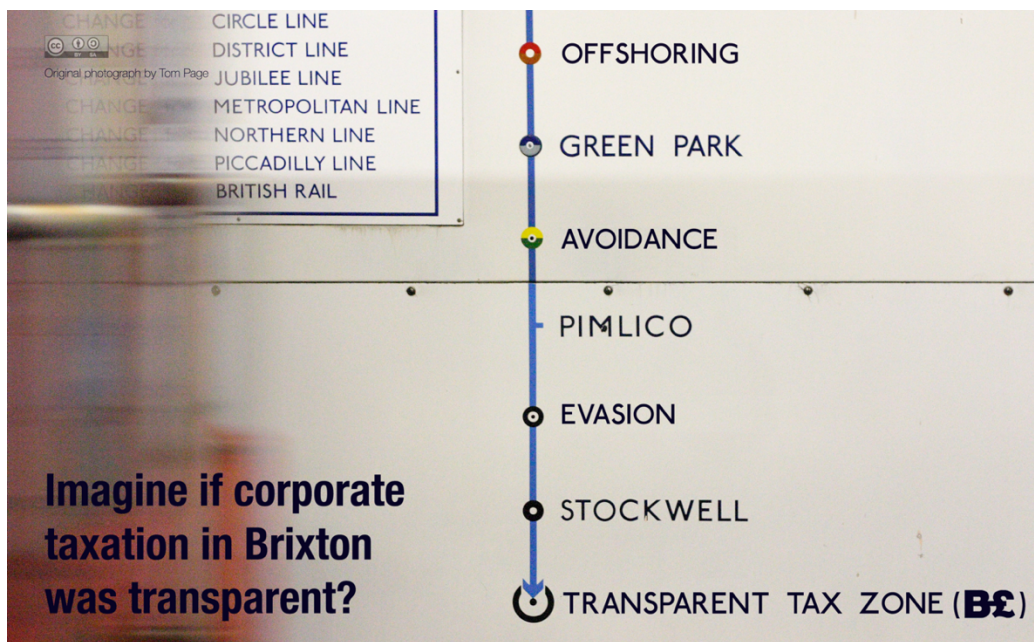


Figure 34. Digital flyer inviting attendees to the initial workshop—tax-based themes replace Oxford Circus, Victoria and Vauxhall stations.

Very quickly: we ran an initial workshop, during which we explained the theoretical frame, explained some problems with opaque taxation, explained Design Fiction, and then asked *what do you think?*

Using the feedback and insights from this workshop I and James developed various Design Fiction artefacts that articulated a near future with a transparent taxation system reflective of some of the issues identified. The diegesis of this Design Fiction involved a character called Terry Veblem who, in our world was a benevolent billionaire, Brixton native, and was funding the transparent taxation system in his beloved home borough. We designed various prototypes including a Tinder-like swipe system for voting on what issues might get fixed

⁵² James studied for his PhD at the same time as my sister where they became friends. After my sister’s death I and James have remained friends. Several of the projects included in this section were done in collaboration with him—I include this footnote to explicitly reiterate my gratitude and thanks for all of these collaborations, they’ve been incredibly insightful, good fun, and hopefully produced some really tangible and useful insights.

(see ‘App Ecosystem’ in Figure 36), and an Augmented Reality system for viewing how much of the costs of—for example coffee—would actually be paid in tax, overlaid on physical buildings.



Figure 35. Workshop 1, introducing Design Fiction to community members and Brixton Pound representatives.

These prototypes, brought together into a single artefact in the form of the leaflet, were distributed to our community participants, who were then invited to a second workshop. In some ways this leaflet performed a similar role to that of the Game of Drones paper, it ‘contained’ the other Design Fiction artefacts. At the second workshop we asked if participants agreed to be filmed, and as though they were reflecting on 12 months of living with Terry Veblem’s transparent tax system. We conducted these interviews, and using them, created another fictional documentary⁵³ that is reminiscent, in appearance, to the Care for a Robot (4.5, p.98) film. Despite the familiar appearance of the documentary, it is markedly different in various senses too. Obvious differences include the subject areas (robots/taxation), the contrasting stimuli (incidental Design Fiction/science fiction film vs intentional Design Fiction/co-designed Design Fiction leaflet), and the fact that the interviewees were community members rather than post graduate digital economy researchers.

⁵³ See <https://www.youtube.com/watch?v=yW6lhKue9dY>

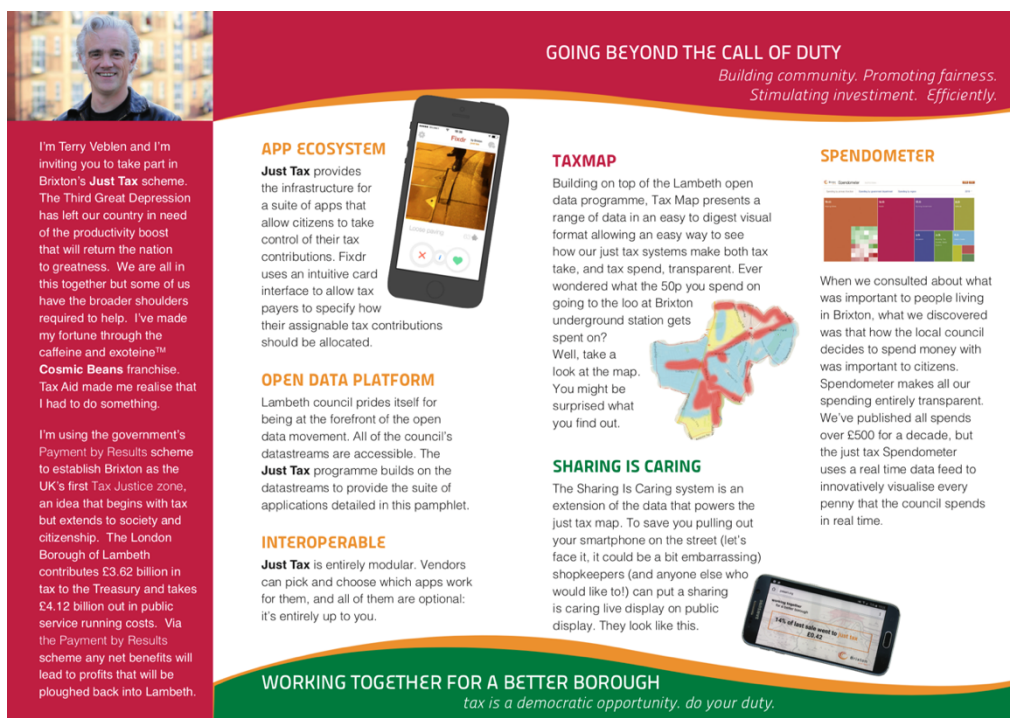


Figure 36. Extract from Terry Veblem’s fictional campaign for ‘just tax’ in Brixton.

Finally, we ran a concluding workshop where the film was screened followed by a discussion about the whole project: the merits of the technique, Design Fiction as a way of critiquing and ideating around the tax system, and anything else relevant that happened to come up! There was an overwhelming sense of positivity about the potential for using this sort of approach, in particular as a tool for participatory budgeting⁵⁴. Consulting with expert advisors we had recruited for the project raised some concerns with this project. Whilst the feedback from our participants was almost universally positive, a tax expert lambasted our prototypes saying they were entirely impractical. Perhaps this was an issue with us communicating the purpose of the project, or maybe the concepts were just too fanciful. Anab Jain, of the agency Super Flux (who practice Design Fiction) was more upbeat, however she was concerned that the film didn’t clearly signpost itself as a piece of Design Fiction. Poignantly she asked “what has actually been designed here?” (Duggan and Lindley, 2015, p. 19). Although I didn’t know it at the time, paying detailed attention to this conundrum (‘in Design Fiction, what just be designed?’ ultimately contributed to the construction of the World Building idea that is one of the thesis’s central findings (see 5.2.2, Design Fiction is World Building, p.141).

⁵⁴ See <https://pbnetwork.org.uk/>



Figure 37. Various shots of Brixton grabbed from the closing sequence of the *Sans Duty* film.

4.7.3 The Near Future School, and the Future of the Academy

These two projects were distinct; however, I have grouped them together as they have many similarities, too. Both were also done in collaboration with Dr James Duggan. Both involved workshops hosted at Manchester Metropolitan University. And, both were interested in using Design Fiction thinking to understand the future of education. This is where the similarities end, however.

The Future of the Academy project came about because of a chance conversation James had with prominent sociologist, Mark Carrigan⁵⁵, where their shared interest in the future of academia and higher education intersected with I and James' shared interest in Design Fiction. Ultimately, we planned "The fictional future of faculty: an afternoon of sociological design fiction". The event was attended by a small but interested group of around 10 people (one of whom we discovered had been so intrigued by the blurb had flown from Spain to take part!) and turned out to be very stimulating. In small groups attendees planned, and to some extent produced, Design Fictions which explored possible futures of Universities. This exercise was particularly interesting for me, leading the Design Fiction side of things, as I asked participants to think through *who* they might be making a Design Fiction for, and for what purpose—based on these factors I suggested they choose the media of the Design Fiction appropriately. Given the attendees' backgrounds, it wasn't particularly surprising to find most of the formats were textual and included political manifestos, newspaper articles, journal articles and a fictional memoir. Clearly in the short timescale these were all 'sketches', so to speak, but some interesting ideas were explored nonetheless (Figure 38). One of the attendees, a senior

⁵⁵ See <https://markcarrigan.net/>

manager at the Manchester School of Art and Design, rather flatteringly said “I only came by mistake, I thought something else was happening in this room. However, this was fun. Also, I’ve been to more management visioning sessions than I’ve had hot dinners, and this technique is by far the best one I’ve seen!”—how much truth was in this statement I do not know, but it was encouraging!

From 2015 to 2019 approximately 600,000 students sought student loans to cover the expenses of undergraduate degrees. The austerity policies of the Corbyn-lead department for education require that individual Universities contribute to reducing the number of loan applications by 50% over 10 years. At MMU 50% of undergraduate course applicants are aged 18 to 20. Current research demonstrates that the 18-20 age group tend towards inefficient use of loan funding, with 85% agreeing to the statement “Is a student loan free money?”.

In the paper we describe a trial conducted at MMU across the departments of geographical and environmental sciences and in the department of fine art. This longitudinal study was carried out over 2 years. During the study period, applications from 18 to 20 year olds were automatically rejected. In order to evaluate the impact of the intervention the study gathered data to produce metrics pertaining to student attendance, concentration, disruptiveness and overall attainment. In addition a qualitative study reports the perceived impact from the point of view of teaching staff.

Initial findings report clear distinction in impact between the two departments. In the fine art department the mean level of overall attainment remained the same, however deviation from this mean increased considerably. In contrast the geographical and environmental sciences department’s intervention highlighted significant improvement in attainment and attendance. Various unintended consequences of the trial were reported colloquially within the teaching staff, the most notable of which was the possible sale of the Birley Fields campus buildings.

Figure 38. Example ‘Design Fiction’ in the form of an abstract from a speculative research paper written about an alternative funding scheme for UK Universities.

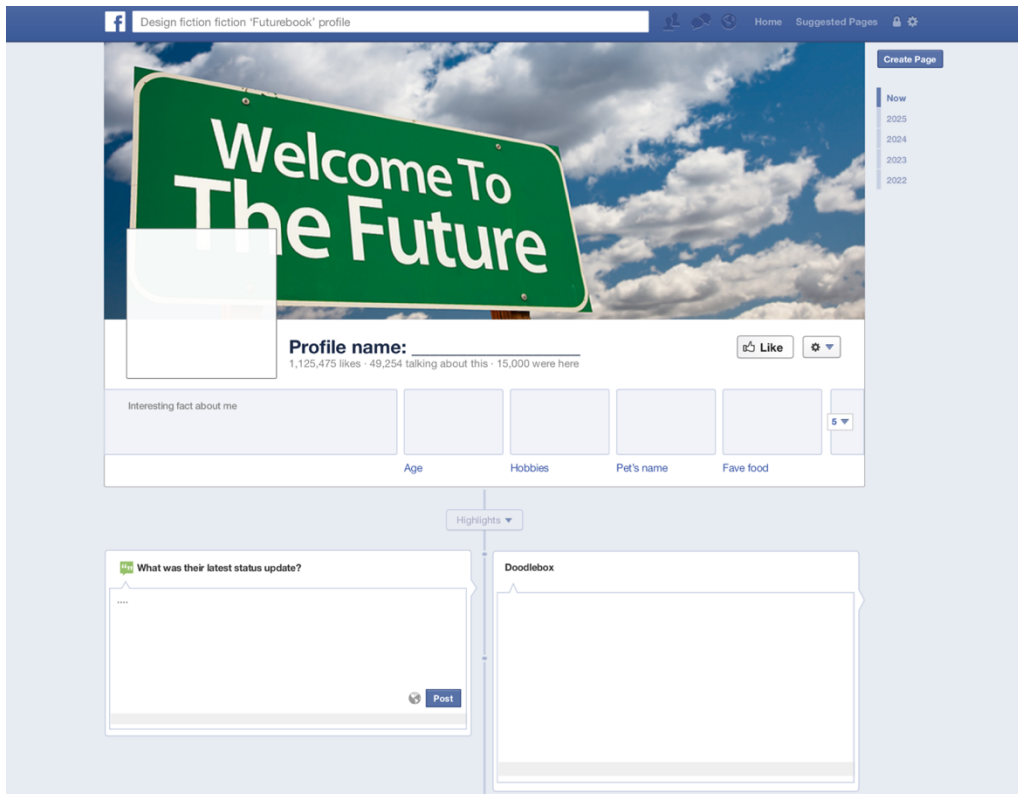


Figure 39. Blank social profile ‘worksheet’ used in the Near Future School project.

The other project—The Near Future School—was rather more complex and more involved. Once again there was a workshop, but this time it ran across the whole day, and the participants were an entire class of pupils from a local school, aged 13 and 14. Broadly, the day broke down into three sections, an introduction to Design Fiction, an ideation session, and a reflective session. In the ideation session we tried to encourage the pupils to generate as many future scenarios as possible by brainstorming positives and negatives about their experience of school *now*, then generating personas by populating blank social media profiles (Figure 39) who ‘lived’ these positives and negatives, then using ideation cards to explore possible technological responses to the personas, finally bringing these elements together in the form of Design Fiction stories. Once the stories had been produced we facilitated discussion and reflection on them in order to tease out salient facts about the diegetic worlds the pupils had created, and to sense-check some of the more extreme stories (I remember one that essentially suggested turning the school into a ‘Battle Royale’ style death game).

The Near Future School workshop was highly productive. Arguably what we did on the day wasn’t *really* Design Fiction—depending on whether you think short pieces of creative writing do/don’t qualify as Design Fictions—but regardless of that nuance the approach was certainly *inspired* by Design Fiction. It was, as with the Future of the Academy workshop, very well received by both the pupils and their teachers. Ultimately neither workshop contributed *directly* to my PhD thesis, but nonetheless both were interesting and certainly played an

indirect role in helping me develop my thinking. Also, the workshop helped to underpin a paper published in the *Futures* journal which explores the practical and ethical issues around developing speculative governance through participatory Design Fiction production with young people. It builds from the philosophy of Benedict de Spinoza, and using that lens unpacks Design Fiction's multiple inheritances, from fiction and design and art (Duggan, Lindley and McNicol, 2017). Although separate from the paper's internal scholarship and contributions, it is fascinating to reflect on the stylistic contrasts between this publication and other pieces of work I have published. In my view, although the paper recounts something which is, essentially, a Research through Design approach, necessarily due to the nature of the publication, its rhetoric and style is quite far from that RtD-foundation⁵⁶.

"Britain's got Teachers"

Pupils can provide live feedback to their teachers, via connected devices. Similarly to televised talent shows, feedback is provided instantly. Teachers who consistently get bad feedback could modify their style or be given help. The story uses robotic teachers, however could also work for human teachers!

Figure 40. Example summary of a pupil's story, summarised during group discussions.

4.7.4 Lemon Difficult Consulting

In early 2016 I, along with collaborators Robert Potts and Dhruv Sharma, decided to respond to a call for funding. The fund was to seed innovative start-up ideas, based on doctoral research, and our idea—one we had discussed at since we originally collaborated on Anticipatory Ethnography—was for a futures-oriented consulting company (Lindley, 2016). Ultimately, we made the application, it was successful, but then I and Dhruv withdrew from the project in order to focus on other endeavours. As an aside, it is a reassuring vote of confidence that the panel handing out grants believed that a Design Fiction-focussed agency was worth funding, although I personally pulled out of the project. The relevance here, however, is the name Lemon Difficult. For a long time, we had discussed this concept, and throughout, we had referred to our hypothetical company by this name. It comes in reference to the 2009 political satire *In the Loop*. Two characters in the film are discussing a task that neither one of them wants to do. One tries to convince the other by saying *it will be easy-peasy lemon-squeezy*—a British idiom meaning something is not difficult—his colleague retorts *No, it will be difficult-difficult, lemon-difficult*⁵⁷. While the three of us were all united by the idea that *doing futures* research is possible, we also agreed upon the fact it is hard to get right, it can be hard to make sense of, and it can be hard to articulate. Futures research can be *Difficult, difficult, lemon difficult*. I enjoyed the joke of the name so much that I decided

⁵⁶ This is, perhaps, another reflection of the challenges discussed earlier (see 1.3 Design Fiction and Cross-inter-post-and-trans Disciplinary Boundaries, p.11).

⁵⁷ See <https://www.youtube.com/watch?v=7mAFiPVs3tM>

to, in part as a Design Fiction experiment, tried to create the essence of a future-oriented consultancy with this name.

LEMON
DIFFICULT



Juicing the future.

@lemonconsultant

Figure 41. One of several banners created for the really fictional consultancy business *Lemon Difficult*.

Although the company does not exist, by creating pseudo-marketing materials publicised via a Twitter account, it was surprisingly easy to give rise to the essence of a real organisation. By following and engaging with interested parties on Twitter I was able to, with only a day's effort, recruit over a hundred followers, including futures professionals, business executives, and even politicians involved in strategic planning. Encouraged, I continued the ruse, writing about the founding of this organisation on an *Ethnography Matters* blog (Lindley, 2016) and including it as an example of commercial Design Fiction usage on Wikipedia (this has subsequently, rightfully, been redacted).

Although perhaps the most interesting thing about this project how powerful some plausible and (depending on your opinion) attractive marketing materials are, in addition to that—in part because of the funding the initial proposal attracted and in part because of the interactions and following gained on Twitter—I am in no doubt of Design Fiction's commercial viability⁵⁸.

⁵⁸ Of course, the work of Superflux, Design Friction, and the Near Future Laboratory also demonstrate the same sentiment!



Figure 42. The (no longer updated) Twitter page for @lemonconsultant.

4.7.5 FCDFE, “Fucduff”, of the (first) Fictional Conference on Design Fiction’s Futures

In 2015 I went to the British HCI conference where a short position paper I and Paul Coulton had authored, arguing for clarity around communications to do with Design Fiction, had been accepted. Coincidentally the paper—Back to the future: 10 years of design fiction (Lindley and Coulton, 2015a)—despite being published at a venue sometimes derided by HCI researchers as irrelevant, and only being two pages in length, is one of my most cited papers. By chance on the first day of the conference I met Shaun Lawson, Ben Kirman and Conor Linehan, HCI researchers who have been very influential with respect to Design Fiction’s development usage within the HCI discipline, as well as spawning a whole research programme around the Dog Internet (Lawson, Kirman and Linehan, 2016; Kirman, Lawson and Linehan, 2017). After various informal conversations about research and Design Fiction, Ben approached me at a later date and asked if I would like to co-chair a fictional Design Fiction conference with him. Of course, I accepted, and we proceeded to organise the first Fictional Conference on Design Fiction’s Futures⁵⁹. I must acknowledge that although I contributed in various ways to this project, Ben deserves the lion share of the credit.

We were in fact targeting an academic venue with this work and aspired to use the process of chairing the conference to form the basis of a submission for the 2016 Nordic HCI conference, who had published a call specifically for Design Fiction submissions. Ultimately the paper we submitted was rejected from the conference, however it will be published in 2018 as a chapter in *Funology 2*

⁵⁹ See <http://www.fictionalconference.com/> and <http://twitter.com/fictionalconference/>

(Kirman *et al.*, 2018). Although we never actually intended to host a conference, the project involved creating various artefacts around the notion of a conference. This included website, Twitter account, committee, but also extended to a *real* call for contributions. The call explained that the conference wouldn't ever happen, however that did not mean we didn't get some submissions from authors who believed there may be a real conference. After clarifying what was going on, we assembled the submitted titles and abstracts into a programme.



Figure 43. Logos developed to support the publicity for FCDF.

The piece we wrote about the whole process is an example of Research through Design and reflects on various aspects of using Design Fiction in this way. One particularly interesting concept that I helped to develop is the idea of a “Nolan number”. This is a way of trying to quantify how much any given submission (to FCDF) was a meta comment on Design Fiction:

*“Some submissions clearly interpreted the FCDF Cfp as an invitation to showcase examples of how Design Fiction could be applied in the future, e.g. Haptic Communication in Virtual Reality English Education: 3D Creative Writing. In contrast, some other submissions were applying design fiction to itself, e.g. Design Fiction Considered Harmful. The Nolan Number that we started referring to was a subjective measure of ‘how much’ a particular title was in fact a design fiction referring to itself. This resurfaced when discussing the closing plenary, a fictional event in a fictional conference, which features a collection of fictional characters noted for creating their own fictions, talking about fiction.” (Kirman *et al.*, 2018)*

While fascinating, good fun, and hopefully useful in some way, FCDF made me realise that the trajectory I had embarked upon with Game of Drones, could result in disappearing down a very deep, dark, and twisty rabbit hole of *academic* discussions in *both* senses of the word, *academic* (see 2.5 ‘Academic’ Means ‘Not of Practical Relevance’, p. 35). Although such an observation doesn't detract from the endeavour's worthiness, this made me mindful to keep

one eye on translating the outcomes of my doctorate into *real* applications—whether inside or outside of academia.



Figure 44. Extract showing some of the papers submitted to the conference.

4.7.6 My Pre-Doctoral Post-Doctoral Research on PETRAS

In the middle of 2016 I took a postdoctoral research position. The intended aim of the position was to utilise Design Fiction to research issues around the adoption and acceptability of domestic Internet of Things devices as part of a project called PETRAS⁶⁰. I have been cautious about including work attached to my professional position within this thesis in order to be able to demonstrate that each activity is administratively separate from the other. However, intellectually, there is unavoidably quite a lot of crossover. The most salient point is that during the two years I have been working on PETRAS the findings held within the final chapter of this thesis have been tested, experimented with, and refined. Whilst the case studies detailed in the thesis are the foundation for my responses to the research questions, it has been through putting those answers into practice during the subsequent two years that those answers have been galvanised and polished.

⁶⁰ See <https://www.petrashub.org/>

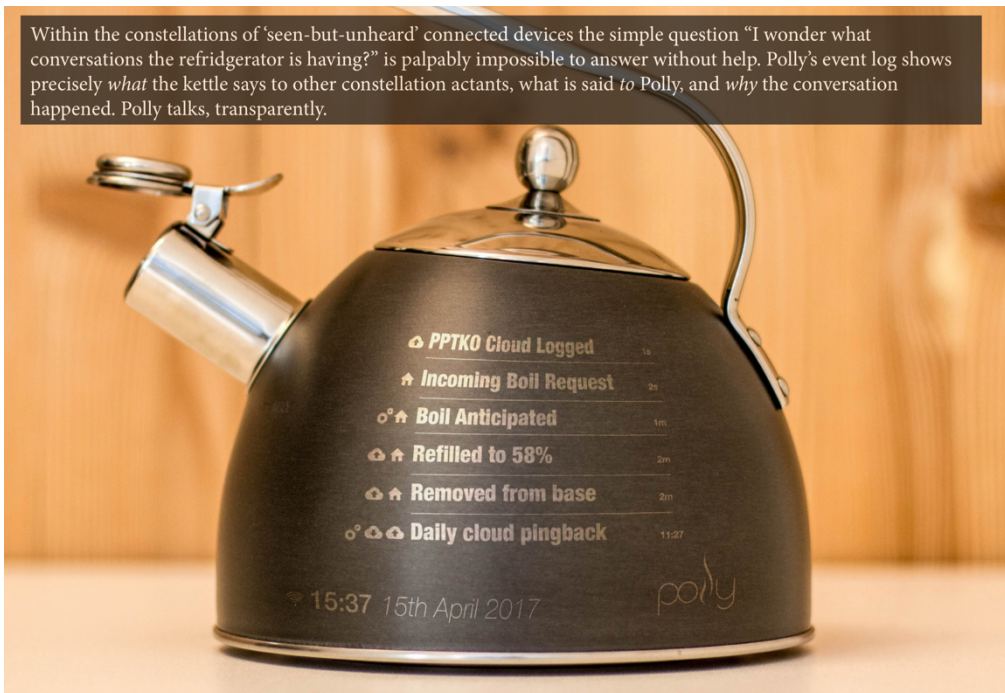


Figure 45. Extract from a booklet describing the Polly kettle⁶¹ showing the kettle's data event timeline.

The scope of the Design Fictions created and utilised as part of PETRAS is broad. They included the design and creation of 'Polly'—a smart kettle designed to explore ways of designing products that are more transparent than typical connected products today (see Figure 45). In addition to user interface designs, and some technical schematics, Polly's design fiction included a wide range of other materials including a press release, instruction manual, crowd funding campaign, and merchandising and advertising materials. Polly was one of the first projects conducted with the fully-formed World Building hypothesis in mind (see 5.2.2, Design Fiction is World Building, p.141).

⁶¹ See http://eprints.lancs.ac.uk/84761/4/Polly_Design_Fiction_Booklet.pdf

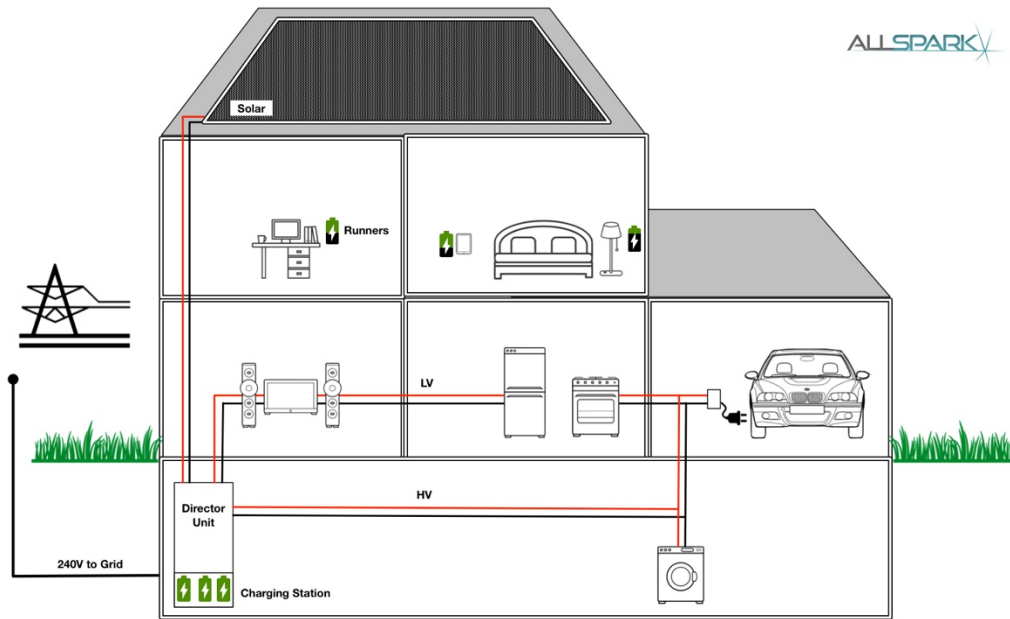


Figure 46. Diagram detailing how a home would be wired into the Allspark system.

The ‘Allspark’ project explored the possible impact of smart grids on habits around power consumption. Building from the idea that DC power may become more prevalent as we move toward power that is generated sustainably, and therefore must be stored in a range of batteries, the work involved designing at a macro level with respect to our electricity system (e.g. a comprehensive infrastructure for how such a system would work alongside existing power grids, Figure 46), as well as prototyping how this would manifest on the design of specific products, user interfaces, and what the effect of these may be on behaviours (e.g., Figure 47.)

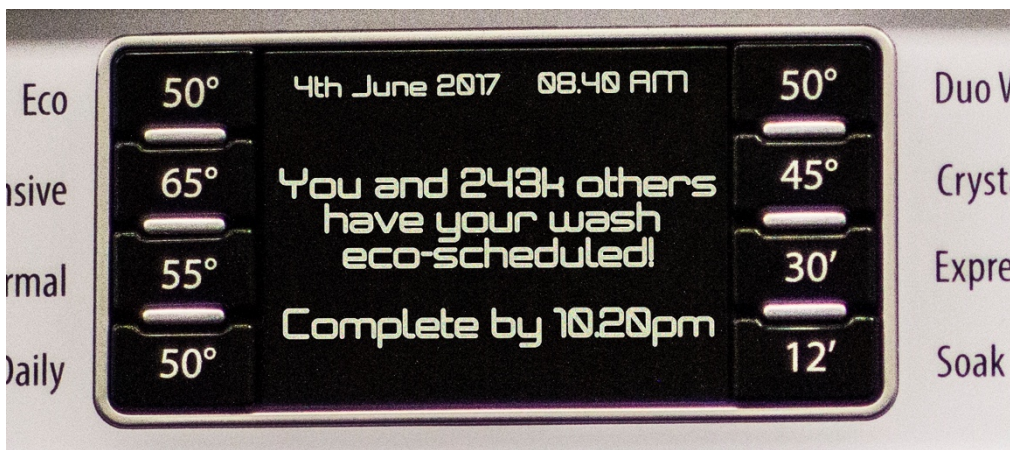


Figure 47. Prototype design for an Allspark washing machine. In this future non-urgent tasks such as washing clothes would be scheduled on a national level in order to optimise battery charge/discharge. Nudge techniques may be used to influence consumer behaviour.

The ‘Orbit’ project utilised world building in a slightly different way, and through the various prototypes created intended to experiment with ontology, specifically the Bogostian form of Object Oriented Ontology’s call proposition ‘Carpentry’ (Bogost, 2012). Carpentry’s purpose is to bridge the vexatious practice-theory gap, it is “philosophical lab equipment” (ibid) and provides creative means to make real what would otherwise remain very much philosophical. The project is described in detail elsewhere (cf. Lindley, Coulton and Cooper, 2017; Lindley, Coulton and Akmal, 2018), but in essence we used Carpentry as a generative tool to create design concepts that helped us to understand the relationships connected devices have with the data on which they depend (Figure 50).

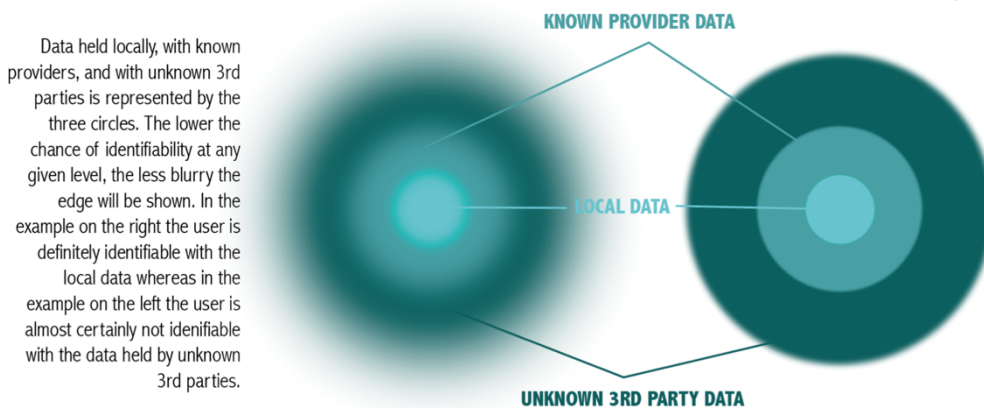


Figure 48. Design concept generated using Carpentry.

Although the *concept* was developed through various experiments with Carpentry, in order to then test and communicate how this concept would work in the real world we packaged the idea into a Design Fiction ‘wrapper’. Using the logics of Design Fiction as World Building the concept design into a fictional configuration app, which in this example configured the privacy settings relating to a smart door lock (Figure 49).

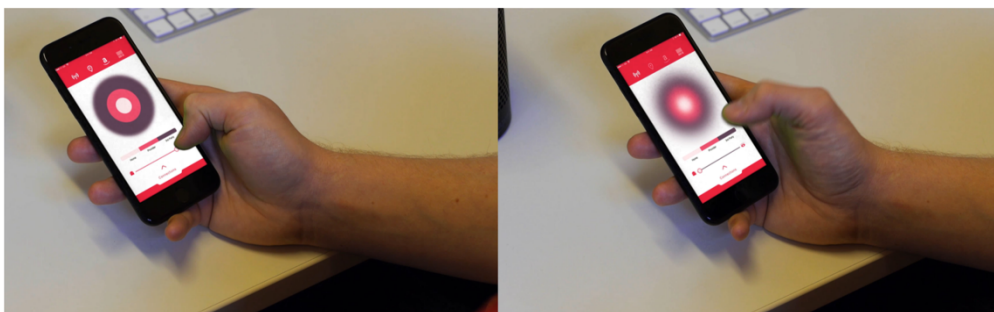


Figure 49. Still from a film showing how the Orbit design concept would exist within a connected product ecosystem, in this case to configure a smart door lock.

A THESIS ABOUT DESIGN FICTION

The purpose of these notes on projects that I have conducted outside of the doctorate's scope is to exemplify that the findings presented in the subsequent chapter are not only born out of the main case studies, but have also been triangulated and tested multiple times. Within the PETRAS project (which spans multiple Universities, has many industrial partners, and overall has an engineering focus) Design Fiction is a relative outlier; for this primarily engineering-led project speculation was a new idea. Despite the slight 'otherness' of the approach, the work has been warmly received, academically as well as by PETRASs industrial partners and by its government sponsors. For a convenient precis of all this work, the various Design Fictions created for PETRAS—documented in the 'Little Book of Design Fiction for the Internet of Things' (Coulton, Lindley and Cooper, 2018)—exemplify and support the responses to my research questions that are detailed in the final chapter.

5 Contextualised Conclusions and Constructed Contributions

5.1 Introduction to the Conclusions

In this section I proffer my conclusions. They are contextualised in the sense that, most of my conclusions are derived from quite specific material explorations into Design Fiction, through what you might call ‘constructions’ (of Design Fictions, but, as per Constructionism, also knowledge). This final section, then, is made up of contextualised conclusions about constructed contributions. It is also fun to play with alliteration and using several words that, through their phonic similarity trip off the tongue. Moreover, despite these being conclusions of some sort or other, I do not mean to suggest that I provide any proofs or concrete answers to my research questions. To respond to my research questions with any concrete certainty would contradict the onto-epistemic foundation that this research sits upon, detailed theoretically in *What Is This ‘Research’ Thing Anyway?* (p.37) and recounted practically in *Case Studies* (p.65).

Specifically, the guidance offered by Gaver with respect to RtD, suggests that the theory I might have produced should only ever be aspirational and contingent (2012). And, *it is*. Further, if I were to venture that I had a grand framework that contains holistic answers to my questions, even if they’re not concrete answers, that in itself would probably cause problems for the postmodern slant of this work. But, of course this thesis’s conclusions are not empty; there *are* tangible and meaningful contributions. Those contributions are constructions though, in both of the senses that Papert meant; that through the making of things (constructions), ideas (constructs) will become more tangible too (cf. Ackermann, 2001). By-and-large the things I have created have been Design Fictions (though in some cases I used others’ Design Fictions to construct meaning) and, inherited from those Design Fictions’ ultimate particularity, the constructions are quite specific and contextual. However, that is not to say that there are no generalities that may be extracted or overlaps of insight between the constructions.

My literature review (see 2, p. 15) framed my research questions: What *is* Design Fiction? What can it *do*? What is the *best way* to do that? In this section I provide contingent, contextualised, constructed, and aspirational answers to those questions. Finally, I conclude with some meta-reflections on the doctorate, and have a brief discussion about the future of Design Fiction and further research directions.

5.2 What is Design Fiction?

5.2.1 Contextualising the Question

Recently, as part of ‘post-doctoral’ research I have been conducting related to the Internet of Things (IoT)⁶², I have drawn upon Object Oriented Ontology (OOO) as a way to characterise the gamut of spectra of ideas that collectively get referred to as “the IoT”. Part of this theory, as it is put forward by Ian Bogost, is that any given object (by the way, in OOO *anything* can be an object, from physical things at any scape, to constructs or emotions) will most likely be constructed of many other objects. Bogost uses the 1980’s video game *E.T. the Extra-Terrestrial* as an example, the game is simultaneously 8 kilobytes of opcodes, several hundred thousand lines of source code, a plastic cartridge, a memory-etched wafer, ‘the worst game ever made’, intellectual property, a constituent of 728,000 video game cartridges buried in New Mexico as part of a financial scandal, not to mention the system of rules, mechanics and procedures which come together to form a thing one can ‘play’ (Bogost, 2012). There is no elementary unit which comprises the video game, it is never a single one of the objects above, nor is it their conglomerate. Even though I’ve dedicated this doctoral thesis to trying to find out the singular truth of Design Fiction, at the end of the day a similar sort of framing (to the multiplicities of OOO) is probably necessary when trying to account for what Design Fiction really ‘is’—and that is *no single thing*.

Design Fiction *is* the ideas articulated in Bleecker’s essay; it *is* the intentional use of diegetic prototyping; it *is* a means of exploring ‘unknown unknowns’ offered by the Near Future Laboratory; it *is* a way of looking at pre-existing artefacts so as to derive insights from them; it *is* a making practice, analytical practice, a subject *of* and a method *for doing* academic research; and it is a service that can be sold to clients. Although each of these statements may be true, they don’t provide much by way of a ‘handle’ to actually operate Design Fiction with, hence are not really satisfactory answers to the research question.

At the outset of this research it would have been fair to say that the that the thing people referred to as Design Fiction was, simply a way of looking at things (Tanenbaum, Tanenbaum and Wakkary, 2012c), and it was, alternatively, a

⁶² In 2016 I began working as a Research Associate on the PETRAS Cybersecurity for the Internet of Things Research hub, see <https://www.petrashub.org/outputs/> for a list of outputs from the project including work I have been involved with.

construct which can be used in various ways to explain, legitimise or frame ideas (Markussen and Knutz, 2013). *However*, although both explanations *appear* to have some common ground, they were in fact incompatible (as described in my literature review) with each other, and also with other competing accounts of Design Fiction, and further, with most examples of Design Fiction practice at the same time! There were some frequently appearing themes, but despite these there was a vivid lack of clarity across the full range of discourse.

This situation hasn't completely resolved itself. Design Fiction is, *probably*, still pre-paradigmatic. An accepted consensus is yet to emerge. However, I and collaborators have developed one way of articulating Design Fiction that concurs with the case studies in this thesis and has potential to cohere with many (I would not go so far as to say *all*) of the possible perspectives on Design Fiction which seem to exist at the moment; this is *Design Fiction as World Building*. Hence, I tentatively offer one possible answer to my first research question below. Whether this will 'stick' and become a part of Design Fiction's first proper paradigm remains to be seen, but either in acceptance or rejection it will play some role in the further maturation of what is referred to as Design Fiction. Although I proffer answers to the other research questions too, Design Fiction as World Building—in response to the query *What is Design Fiction?*—is certainly the most clear contribution the thesis has. However, as is also true with the remainder of this section, the insights it offers should be seen as *products of* the entirety of the thesis, from literature review, to methodology, to case studies.

5.2.2 Design Fiction is World Building

This approach—articulated in a paper co-authored by myself, Paul Coulton, Miriam Sturdee and Mike Stead (Coulton *et al.*, 2017)—contrasts examples of Design Fiction practice with the popular rhetoric in order (1) construct an argument that Design Fiction is a 'World Building' endeavour, and (2) to provide useful metaphors for creating or analysing these worlds. It begins by returning to the concept of diegesis and looking a little deeper into what David Kirby really means by diegetic prototypes. Alongside, there is a commentary about the word fiction, its many synonyms, and how it can mean anything from *imagined* to *untrue* to *story*. In critiquing possible interpretations of these terms, it becomes evident that—arguably—Design Fiction's often-inferred links to narrative are troublesome at best (and, at worst, *totally* misplaced). As was evident on completion of the Game of Drones project (see 4.6.5) Design Fiction's *do not* necessarily have to have any particular story or narrative at their core: "we argue that framing Design Fictions as 'built worlds' is more useful [than as narratives or stories] because, unlike stories, the frame can be applied to *all* Design Fictions" (ibid).

By looking at practice it's possible to infer an 'appropriate' usage of the word fiction in Design Fiction contexts. This is derived from an unpacking of David Kirby's diegetic prototypes, and what is revealed is a clear *absence* of intrinsic ties to narrative or story. Kirby highlights particular properties of the worlds in which his diegetic prototypes live. The salient factors are that they are consistent

from the moment that they appear on screen, and that they are naturally situated within the whole ‘diegetic world’. In *that* world they become part of ‘everyday life’, and therefore they are essentially, in that world, ‘real’ (2010). While Kirby was solely referring to film as the media container for diegetic prototypes, Design Fictions invoke such worlds and prototypes through the crafting and sculpting of a miscellany of different media and forms. Unlike cinema whose diegetic prototypes are a necessary by-product of storytelling, in Design Fiction it is the diegetic prototypes themselves that are the focus. Thus, one can assert *creating the objects that create the world* is the principal task of the designer when creating a Design Fiction. There is no, and should not be, any implicit concern with storytelling⁶³. When a dependence or implicit relationship between Design Fiction and storytelling is made mistakenly, it is almost always because of the troublesome synonyms of the word ‘fiction’.

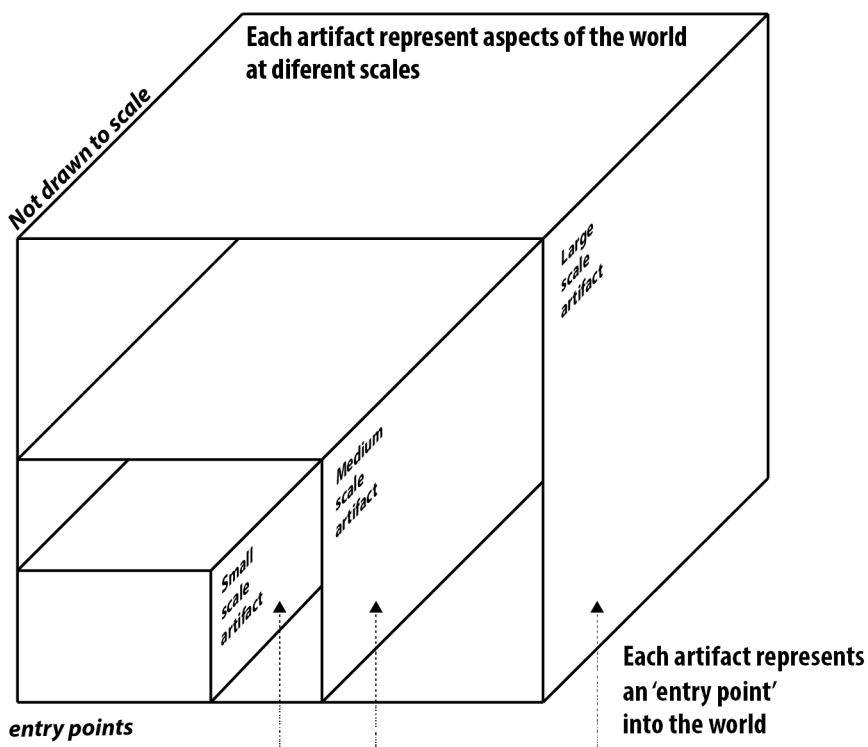


Figure 50. Diagram showing the varying scales of entry points into a Design Fiction world.

If we consider the media within a single Design Fiction, the specific selection media utilised manifests as one-or-more standalone artefacts which together ‘build’ the world (or ‘give rise’ to the world). We suggest two metaphors for describing how the individual artefacts relate to the world. First, let us imagine a Design Fiction world as a distinct entity, one that we can see the overall shape of, but whose complex internal structure is hidden from view. What we *can* see, however, is a series of ‘entry points’. Each artefact that contributes to making

⁶³ The exception to this assertion is when the medium or artefact used to ‘tell’ the Design Fiction world is, itself, a story—which is perfectly valid, but relatively rare.

up this Design Fiction plays its role as a metaphorical entry point to the fictional world.

The second metaphor, which works harmoniously with the first, is inspired by Charles and Ray Eames' film about relative size of things in the Universe, *Powers of 10*⁶⁴. The film shows a number of frames of reference (literally drawn as squares in the film) starting with a 1-meter squared section of an image that includes a couple sitting having a picnic, but then zooming out and increasing the visible area by one power of 10 every 10 seconds. This changing scale is a device that encourages the viewer to constantly reconsider the scene being viewed and show that, depending on the scale that something is viewed at it, it may mean many different things. Although we are not suggesting adherence to the configuration '1 power of 10 per 10 seconds', the basic concept of shifting scale can be applied to Design Fiction worlds and the artefacts that create them. We can think of each individual artefact that constructs the world as a representation of that world, but at a different scale (see Figure 50).

Of course, what it means to build a world, is complex in its own right, it's the of constructing an imaginary realm, and is in fact a process we see regularly in a range of different contexts, each with their own caprices, e.g. cinema, video games, and role-playing games. Applying world building to Design Fiction offers clarity to the diversity of things which may be covered by the term, by shifting the focus away from storytelling (e.g. narrative, characters and/or plot) and instead places importance on the cohesion of the world and how things and people within that world interact. In essence a Design Fiction—when considered as a whole—is a sort of map *of* a fictional world that can be explored or interpreted in a variety of ways, and accessed via the individual artefacts, or entry points. A story or a narrative can, if one so chooses, be a way navigating distinct path through this fictional world, but it isn't *necessary*. In this way a variety of prototypes, situations, and sometimes 'stories', can be nurtured on the substrate of the artificially constructed world. A review of literature related to world building yields a myriad of sources relevant to Design Fiction worlds. 'Alternative Reality Games' build worlds that blur the line between reality and fiction in a similar way to Design Fiction, but with an added emphasis on shared experience (Kim, Allen and Lee, 2008). We can also liken worlds that emerge from multiple artefacts to 'Transmedia Storytelling', where "integral elements of a fiction get dispersed systematically across multiple delivery channels" (Jenkins, 2010). However, Design Fiction does this in order to make an imagined world with multiple accessible entry points, rather than for a 'unified and coordinated entertainment experience' (ibid). Coming from a background in production design and cinema, Alex McDowell describes world building as a design practice in its own right and emphasises believable worlds are a bedrock from which rich and new meanings can be assembled (McDowell, 2015). These heterogeneous perspectives on world building, and examples of it, may provide guidance and inspiration for Design Fiction practitioners as the field continues to mature. Additionally, if we position ourselves to argue that Design Fiction *is* world building, and that world building is extremely varied,

⁶⁴ See <https://www.youtube.com/watch?v=0fKBhvDjuy0>

then it begins to explain why defining or constraining Design Fiction is so difficult! The venue which I and co-authors published a paper about the world building hypothesis—the Research Through Design Conference⁶⁵—is a fairly unique venue. The conference specifically focuses on research that has utilised RtD and for our paper and Design Fiction this meant that “The conclusions offered here are not translated from another field or induced, but they are a direct result of our design process and our direct engagement with the ‘material’ of Design Fiction” (Coulton *et al.*, 2017). In the briefest possible terms and supported by Figure 50 (p. 142) and Figure 51 (p. 144), when seen as world building Design Fictions are collections of artefacts that, when viewed together, build a fictional world. The artificially build world is a prototyping platform for the very same designs that define it, meanwhile those designs reciprocate in kind, and repay the favour by prototyping the world. That is Design Fiction as world building.

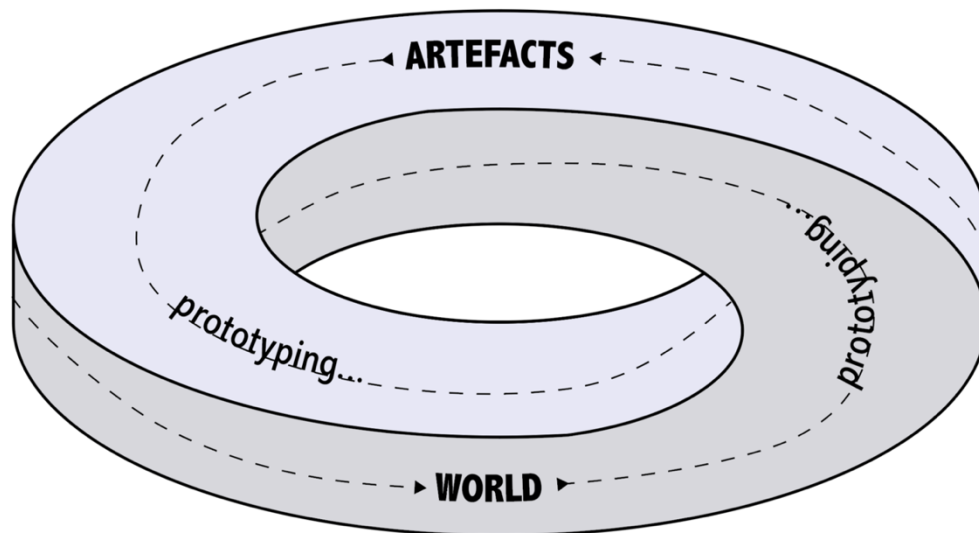


Figure 51. The reciprocal prototyping relationship that occurs in Design Fiction as World Building.

Intriguingly, in 2017 I anonymously reviewed a paper submitted to CHI 2018. Aside from the work’s other merits and pitfalls, the authors articulated an argument almost identical to the World Building hypothesis (complete with collections of artefacts acting as entry points that operate at differing scales). I was concerned that if the apparently-identical idea, but that used subtly different terminology, was published then the push towards a first solid paradigm for Design Fiction would be disadvantaged. In their post-review rebuttal the authors of this paper noted they had not located the World Building paper in their literature search, hence the similarity of the two ideas was just an oversight as opposed to some sort of plagiarism. The important point here though is the fact a completely separate group of researchers came up with a virtually identical

⁶⁵ <https://www.researchthroughdesign.org/>

way of characterising Design Fiction is. Although the theories resulting from RtD are at always contingent, that this other team of researchers arrived an equivalent theory in complete isolation, is perhaps, the best kind of ‘triangulation’ that the World Building proposal could ever hope to have.

5.2.3 Using World Building

The main utility of seeing Design Fiction as world building is to disambiguate something which has traditionally remained elusive. There is, however, no specific or step-by-step method to *do* the world building that I can recount. Instead, here, I reflect on some of the cases described earlier through the lens of world building to demonstrate how it can be used break down Design Fictions.

If we consider Game of Drones (see 4.6, p. 109) the parts of the Design Fiction such as the signage (see Figure 31, p. 119) and qualitative accounts from pilots taking part in the trial (see Figure 33, p. 122) are very detailed, close, ‘zoomed in’ entry points. They articulate, in a lot of detail, very specific parts of the Design Fiction’s overall world (or diegesis). In contrast, the impression of fictional legislation we created and supporting map of Lancaster don’t really offer quite so much detail, but by providing ‘zoomed out’ views make the whole world feel more tangible and real. All the entry points support the suspension of disbelief. Perhaps the most important point to remember is that all of these individual prototypes work *together* to create a whole world and texture it, adding feel, detail, and ‘situating via proxy’ (see 4.3 An Ethnography of the Future, p.82). That world, tests the prototypes and vice versa (see Figure 51, p. 144).

In Care for a Robot (see 4.5, p. 98) the same mechanism plays out; the diegetic prototypes (starting with the robots as they were depicted in the stimulus material, which was derived from Robot and Frank) give rise to the world. However, in the process of being interviewed, the participants in fact inferred and created many more diegetic prototypes all of their own—each of which serves as an entry point into the world despite the fact they had only been ‘designed’ in the eye of the interviewee’s mind. Even though the original diegetic prototype that was used as a stimulus (the robot depicted in Robot and Frank) were appropriated, the world building hypothesis holds true.

World building also works well with Design Fictions that were created with more narrative centrality. For example, Heating Britain’s Homes (see 4.2, p. 68) and A Machine. Learning (see 4.4, p. 92) both—based on my thinking at the time—have ‘stories’ at their core. These stories were used to make the artefacts/entry points more inviting; easier, if you will, to ‘enter’. In the case of Heating Britain’s Homes several physically designed artefacts serve as entry points, as does the supporting story-derived film piece, while in A Machine. Learning, the entire Design Fiction is encapsulated within narrative of the film piece. This raises an intriguing issue which is not addressed in Design Fiction as World Building; are ‘entry points’ part of our world, or part of the Design Fiction’s world? Although it may be ontologically challenging, it seems that they’re best characterised as being both! If it is to maintain an ability to suspend

disbelief, a Design Fiction must always exist in our world. As such, at least one entry point needs to be directly accessible to us. For *A Machine. Learning*, it is the film. But that entry point may provide access to an inner sanctum that has additional layers. Using the same example, the film entry point allows us to see additional aspects, which may too be cast as entry points: for example that red dots denote recording, that AI computers may be ‘smashable’, and a feature that sharing content means holding hands—each of these are also entry points but they exist *within* the diegesis of another entry point. This layering is represented by the concentric spheres, each with entry points that may allow access to the next layer, in Figure 52.

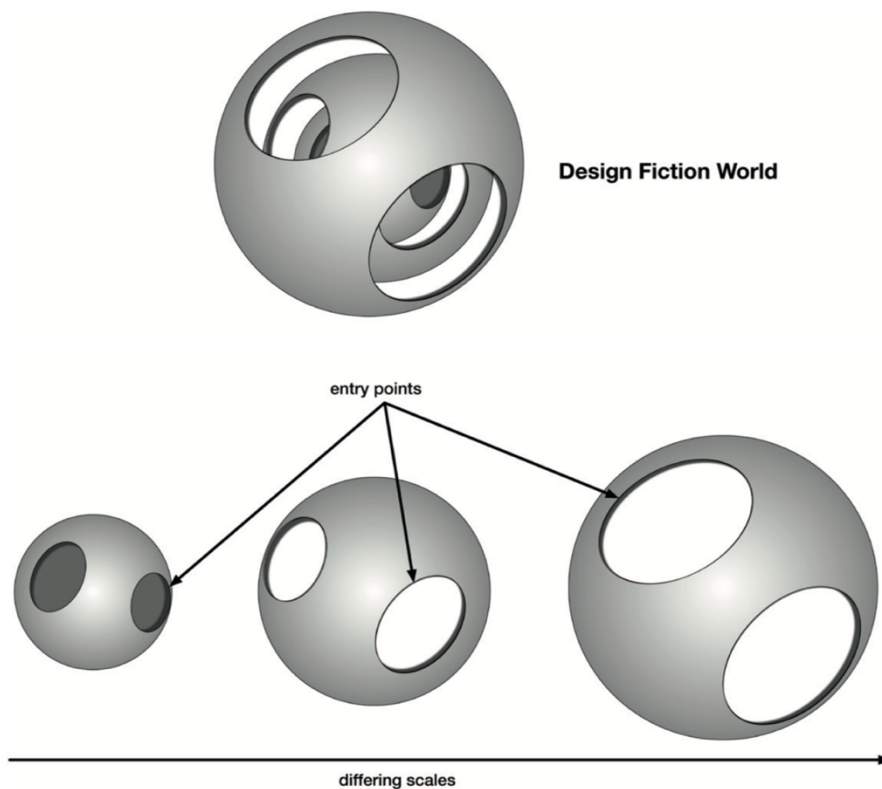


Figure 52. Visualisation of Design Fiction world building using nested spheres.

It isn't always that way, however, as in *Game of Drones*, most of the entry points exists in *our* reality as a standalone artefact (the signs, the map, the law, the landing stations). What remains common in either case, however, is that the overall diegesis—the world that these things collectively take part in, prototype, and build, is what coheres them together and allows them to make sense. I'm tempted to draw a parallel to particle physics. The relatively-recently proven-to-exist Higgs field, and its associated particle, seem sort of relevant here. The field permeates every part of the Universe, and it is by interacting with this field that all other particles are given mass. Without the field nothing—*no thing*—has any weight. In Design Fiction there is sometimes a gatekeeping entry point, by interacting with this, the other entry points are contextualised,

communicated, and ‘given mass’ outside of the diegesis, in our, ‘real’, world. For example, consider Care for a Robot (see 4.5, p. 98), the gatekeeping entry point is the documentary film. That is the only entry point an audience would ever interact with directly, and this is the entry point which ‘gives mass’ to the myriad of potential and possibility within. The effect of this ‘field’ is to give meaning and life to a huge variety of other entry points: in the case of Care for A Robot, everything from the realisation that corridors would need to be widened to the complexities around ownership of property and data.

Moving very much away from the particle physics metaphor it’s important to consider perception too. Figure 52 also helps to do this a little. The diagram represents an entire Design Fiction with entry points at three different scales. Those on the smallest sphere are zoomed in and they would depict the world in minute detail while those on the largest sphere are zoomed out and would provide general overviews. The precise positioning of the three differently-scaled spheres is movable, one sphere can slide around inside the other. Further, while one observer may view the sphere from above, another may view it from the side. The upshot of this is that for any given Design Fiction we should never consider what (specific) meaning is being put forward by this particular combination of entry points, but instead what are the range of meanings that observers *might* draw from them. The built worlds of Design Fictions are, in this way, very much, moveable feasts.

The world building approach to design fiction is, itself, a metaphor. Further, it is a metaphor that I have had to use further metaphor to articulate. Moreover, while it provides some organising principles, it is still quite distant from a step-by-step method or process through which one can embark on Design Fiction production or analysis. A curt response to this situation might be to say *that requires further research*. Whilst the call for more exploration is worthy, and that research *should* be done, the world building hypothesis is still useful in its current state; any Design Fiction can feasibly be broken down in terms of its entry points, and those entry points can be understood in terms of their scale, but also their many possible interactions with themselves and the outside world (see Figure 50, Figure 51, Figure 52). Making the underlying mechanisms that cause Design Fiction to work (or alternatively that work when Design Fiction does) become visible empowers anyone who tries to create, look at, or otherwise work with one. In work conducted outside of the doctoral research as part of my postdoctoral Research Associate position on the PETRAS project I, and others, have utilised the world building approach and it has proved to be useful in a number of ways. The Little Book of Design Fiction for the Internet of Things is a short book that offers abridged content derived from a series of research papers that I co-authored, and that utilise Design Fiction as World Building variously to produce technology-driven, product-driven, and problem driven Design Fictions (Coulton, Lindley and Cooper, 2018). These have been applied in a number of contexts. For example to help underpin original research into the Philosophy of Technology by using Design Fiction to experiment with Speculative Realism and Object Oriented Ontology (Lindley, Coulton and Cooper, 2017; Lindley, Coulton and Akmal, 2018), to augment and support the activities of foundational technical research by bridging the gap between

possibility and domestication (Lindley, Coulton and Sturdee, 2017), and to argue that policy-makers and technologists take a more critical stance on notion such as ‘Privacy by Design’ in order to avoid falling into hubristic ‘Heffalump traps’ (Lindley, Coulton and Cooper, 2018). Although touching upon a wide range of areas, all of these projects directly built from and utilised the approach to world building described here.

So, within the realms of the contingent and aspirational theory that one might expect by adopting the RtD approach, I suggest that Design Fiction *is* World Building. Of course it may be more or less than that at the same time, and how the world building process is articulated, used, and perceived will almost certainly change through time, but, insofar as it is *possible* to answer my question *What is Design Fiction?*—Design Fiction is World Building.

5.3 What can Design Fiction do?

5.3.1 Contextualising the Question

There are several, maybe pedantic, ways to respond to this question quite easily, but that don’t, on the face of it, really provide any tangible or useful answers. The specific responses I had in mind are things like “it depends on the context” or “Design Fiction can do whatever you want it to do”. While both seem perfectly reasonable answers to me, if unqualified, they may appear rather antagonistic. Another (also apparently dismissive) way to respond to the question is to quote a definition. One could say “it can support the creation of diegetic prototypes to suspend disbelief about change” or, in reference to the previous section, “it is a way of building prototypical worlds”. These answers fall into the sort of category that 42 does to the ultimate question of *What is the answer to life, the Universe, and everything?* As the philosophers exploring the problematic answer eventually figured out, the issue is not with the answer, but with the question⁶⁶. To understand what it *means* that 42 is the answer to life, the Universe, and everything, first you must properly understand the question. Through the various prior sections of this thesis, I hope to have provided some frames for understanding the breadth and scope of the question *What can Design Fiction do?* However, in much the same way that asking what philosophy, maths, literature, or dance ‘can do’, it is impossible provide a succinct answer. However, what *is* possible—and I think is productive—is to explore and discuss some of the *possible* answers, and hence, to at least shed some light on the conundrums, if not to fully illuminate them.

66

[https://en.wikipedia.org/wiki/Phrases_from_The_Hitchhiker%27s_Guide_to_the_Galaxy#Answer_to_the_Ultimate_Question_of_Life,_the_Universe,_and_Everything_\(42\)](https://en.wikipedia.org/wiki/Phrases_from_The_Hitchhiker%27s_Guide_to_the_Galaxy#Answer_to_the_Ultimate_Question_of_Life,_the_Universe,_and_Everything_(42))

5.3.2 From Research to Deceit: Design Fiction can ‘do’ Many Things

In order to explore the possible answers, I need to use a series of different frames of reference. The first is to recall how I explored, based on Frayling, design’s relationship with ‘research’ (see Figure 5, p. 44 and 3.2 What Happened When Design Met Research?, p. 41). The diagram shown there *originally* appeared in my paper *A Pragmatics Framework for Design Fiction* and was presented at the European Academy of Design Conference (Lindley, 2015a). As Frayling discusses for art and design I extended to Design Fiction. You can do research *for* a Design Fiction (gathering contextual information around the area of interest, e.g. my test flights in the early days of the Game of Drones project); you can do research *into* Design Fiction (e.g. the sort of literature search included in this thesis, see 2 Literature Review, p. 15); you can do research *through* Design Fiction (e.g. what arriving at the world building hypothesis through practice). Crucially, it’s important to remember that it’s possible (and likely) that all three of these will interact somehow. As is the case with this thesis it was necessary to do some background research *into* Design Fiction straight off the bat; that knowledge is useful in order to do research *through* Design Fiction, but also crucial is to do contextual research around the domain in question, which of course is research *for* Design Fiction. The most meaningful answer this frame offers to the research question, however, is that one thing Design Fiction can ‘do’ is to be a research method. Doing *Research through Design Fiction* is a way of producing original knowledge; arriving at original understanding and new knowledge. Making theory. There is much more to Design Fiction through, it is not *solely* the preserve of those wishing to uncover new meaning about the world.

We might also frame Design Fiction as a communication tool, a way of articulating and explaining an idea. One particularly notable sub-genre of Design Fiction used as a communication tool is those that I have referred to as *Vapour Fictions* (Lindley, 2015a). These include corporate visioning videos depicting next generation technologies and products, such as Corning’s *A Day Made of Glass*⁶⁷ and Microsoft’s *Future Vision*⁶⁸. Some would argue that these types of artefact are not, strictly speaking, Design Fictions, however this seems to be a moot point given how frequently they have been referred to in the same breath. The two examples above are from corporate giants, but Vapour Fictions have recently become the preserve of entrepreneurs and start-ups too, powered along by the proliferation of crowd funding websites. As I and Paul Coulton have discussed in work published at the European Academy of Design Conference, such Vapour Fictions can be used variously. In some famous cases, such as Bel Geddes’ *Futurama*, such work seems to have set in place a technological agenda for years to come, sometimes they have been used to inflate stock prices of technology companies, while in the case of crowdfunding they have driven vast amounts of money have to be invested in nascent or

⁶⁷ See https://www.youtube.com/watch?v=6Cf7IL_eZ38

⁶⁸ See <https://www.youtube.com/watch?v=t5X2PxtvMsU>

embryonic products (Coulton and Lindley, 2017b). Using the video games industry as a case study I and Paul Coulton also proposed a deliberate move toward visioning exercises that embrace Design Fiction's intentionality, and thus strive to avoid the pitfalls associated with Vapour Fictions, while preserving their utility as consultative, research, and marketing tools (Coulton and Lindley, 2016). Blythe et al. have utilised Design Fiction to communicate the results of research endeavours (2015) while the Design Fictions that occupy the liminal space between the corporate and academic world—such as those created by *Superflux*⁶⁹—perform a sort critical communications role for their commissioners. There is of course an overlap between the fact Design Fiction can 'do' research and it can 'do' communication, for example the Care for a Robot project (4.5 Care for a Robot, p. 98) was doing research, but implicitly part of it was to explore the potential of a Design Fiction film to communicate the nuances of questions around technology and ethics. Although the case studies in the thesis don't highlight this particularly, it would be remiss to not acknowledge the fact that, across the wide variety of scenarios such as those described in this paragraph—and most likely in more ways as well—one thing Design Fiction can definitely do, is *communicate*.

From: [REDACTED]
Sent: 02 September 2015 21:58
To: [REDACTED]
Subject: CEDE

[REDACTED]

I'm working on a documentary about empathy and am very interested in the work being done by CEDE. Your attempt to create a working model of the Voight-Kampff machine sounds like an ambitious project with a lot of potential. I would love to talk to you, or someone at CEDE in more detail about the project, what kind of progress you've made since the announcement and the possibility of sharing this story.

To explain a little more about myself; I'm a documentary filmmaker with fifteen years of experience. I spent seven years with the [REDACTED] station in [REDACTED] where I earned a list of awards, including three regional Emmys. I'm currently pursuing projects I hope to distribute nationally/internationally and feel the topic of empathy hasn't been adequately tapped. With this piece I hope to explain empathy in a way that will take this seemingly abstract idea and make it understandable to a general audience. Telling the story of CEDE and your Voight-Kampff machine I believe would help me accomplish this goal.

I look forward to hearing back from you!

All the best,

[REDACTED]

Figure 53. Redacted email from film maker asking to produce a documentary about the entirely fictional Voight-Kampff machine.

Perhaps befitting for the post-truth era, Design Fiction can be used to deceive as well. Drawing on Game of Drones, as well as the Masters work of Haider Ali Akmal I and collaborators discussed this topic in a research paper we presented at the Design Research Society Conference (Coulton, Lindley and Ali, 2016). Looking closely at a series of things that get described as Design Fictions, some are *obviously* Design Fiction; for example, the bright yellow 3D printed prototypes in Uninvited Guests serve as a clear sign that *this is not reality*⁷⁰. On other occasions, even when the Design Fiction is overtly *labelled* as such, they can be mistaken for fact—this was the case with two examples cited in the paper,

⁶⁹ See <http://superflux.in/>

⁷⁰ See <https://vimeo.com/128873380>

Game of Drones, and also project CEDE's fictional Voight-Kampff Machine (Sturdee *et al.*, 2016). While Game of Drones clearly hoodwinked two thirds of its peer-reviewers (cf. Lindley, Coulton and Brown, 2016) project CEDE attracted the interest of a documentary film maker.

Responding to media enquiries about their work, Loizeau and Auger's take things one step further with their Audio Tooth. To begin with the pair introduced their work as speculative design but failing to attract much attention they became rather more ambiguous and suggested they were, in fact, working towards a functional prototype. This resulted in the work being named one of the 'inventions of the year' by Time Magazine.

Orson Welles' contemporary retelling of H.G. Wells' War of Worlds in a radio programme on Sunday, October 30, 1938 is famed for spreading a wide scale panic amongst many of the show's listeners, who believed it to be true. This is a salient example of how effective use of world building can lead an audience to be deceived. The first two thirds of the one-hour broadcast were presented as a series of simulated news bulletins, which suggested an actual alien invasion was currently in progress. Rather than occupying all of the airtime these bulletins were presented as interjections into a music programme. Although popular mythology holds that a disclaimer was hastily added as the CBS executives became aware of the panic caused by the programme, in actual fact announcements describing the programme as a dramatisation of a work of fiction had always been planned and were made at the beginning, before the middle break, after the middle break, and at the end of the broadcast. War of the Worlds embodies the kinds of variables that Design Fiction practitioners can play with in order to tweak the dials on their artificial world in order to create the level of believability, and, perhaps, deception, that they would like. It also demonstrates that even if something's unreality is clearly and explicitly articulated, if other aspects of it appear real then it will, more often than not, be perceived as real. I have utilised this property when presenting the 'Polly' Design Fiction (Lindley and Coulton, 2017; Lindley, Coulton and Cooper, 2017) project. When not introduced as Design Fiction audiences believe the product to be a reality, and then by revealing its fictional nature I have hoped to (1) demonstrate the power of Design Fiction, and (2) suggest that some of Polly's aspirational properties would be quite straightforward to build into real products.

In the examples above, and those explored in the published paper (Coulton, Lindley and Ali, 2016) three descriptors for Design Fiction become evident that relate to the balance between plausibility and deception. *Obvious* Design Fictions, no matter how plausible the subject matter, make signposts clearly visible to the audience. These signposts demonstrate show, even if not *explicitly* communicated then perhaps using the language of aesthetics, that by engaging with the work the audience is being invited to enter something akin to a 'magic circle' (cf. Huizinga, 1955). What is within the circle is a performance, and it is quite clearly 'other', or not real. From my case studies relevant examples are Heating Britain's Homes (4.2, p.68), because clearly a retrospective from the future is not masquerading as a reality, and A Machine Learning (4.4, p.92)

whose style and presentation (similarly to the aforementioned Design Fiction Uninvited Guests) are intended to make it clear to the audience using aesthetics that this is *not* real. The second category are *Identified* as Design Fiction. These are things which *do* call themselves Design Fiction, but that intentionally appear somewhat real (oftentimes by appearing rather mundane). Game of Drones demonstrates this perfectly. Despite the phrase “The research in this paper and the associated artifacts are part of a design fiction” appearing quite prominently the Design Fiction was easily able to deceive because of its relatively mundane presentation as a research paper. The third category, *Ambiguous* Design Fictions, include the likes of Auger and Loizeau’s tooth project. Here the designers, realising that the work’s unreality doesn’t detract from its believability, intentionally *don’t* point out its fictional nature. Across all the categories those Design Fictions which, in whatever context they operate, strive for the most plausibility, seem to tend towards deception. By driving towards diegetic consistency and overall plausibility, Design Fictions are—intentionally or not—*moved towards* deception. There’s an underlying tension with plausibility (or ‘truth’) pulling in one direction and fiction (or ‘untruth’) pulling in the other. The crucial part of how this plays out in Design Fiction practice, however, relates to the way the Design Fiction is presented. Riffing off McLuhan’s famous phrase, rather than the medium being the message, in Design Fiction it is the *format* that is the message (Coulton, Lindley and Ali, 2016).

This line of reasoning is an expansion from the ‘duck test’: if it walks, talks and quacks like a duck then it probably *is* a duck. With Game of Drones, if it reads, gets reviewed, and archives like a CHI extended abstract, then it probably *is* a CHI extended abstract. And for project CEDE; if it has an API for an empathy-detecting device, has a crowdfunding video for an empathy detecting device, and a manual for an empathy-detecting device, then it probably *is* an empathy-detecting device. A system for classifying Design Fictions using an *Anatidae/Non-Anatidae Algorithm* may have been developed on this basis, and is mooted in the Proceedings of FCDF’16 (Coulton, Lindley and Brown, 2016; Kirman *et al.*, 2018)⁷¹. The most salient takeaway point is, so far Design Fiction has—as far as I know—been used in a principled way. However, the techniques that create ‘good’ Design Fictions, may also create quite effective deceptions. The conclusions in the subsequent section—What are the best ways to do that?—provide a series of practical questions which will help practitioners to establish to what extent they may wish to appear plausible and/or deceive.

⁷¹ As it was published as part of FCDF (see FCDF, “Fucduff”, of the (first) Fictional Conference on Design Fiction’s Futures, p. 225) this is obviously not a real paper.

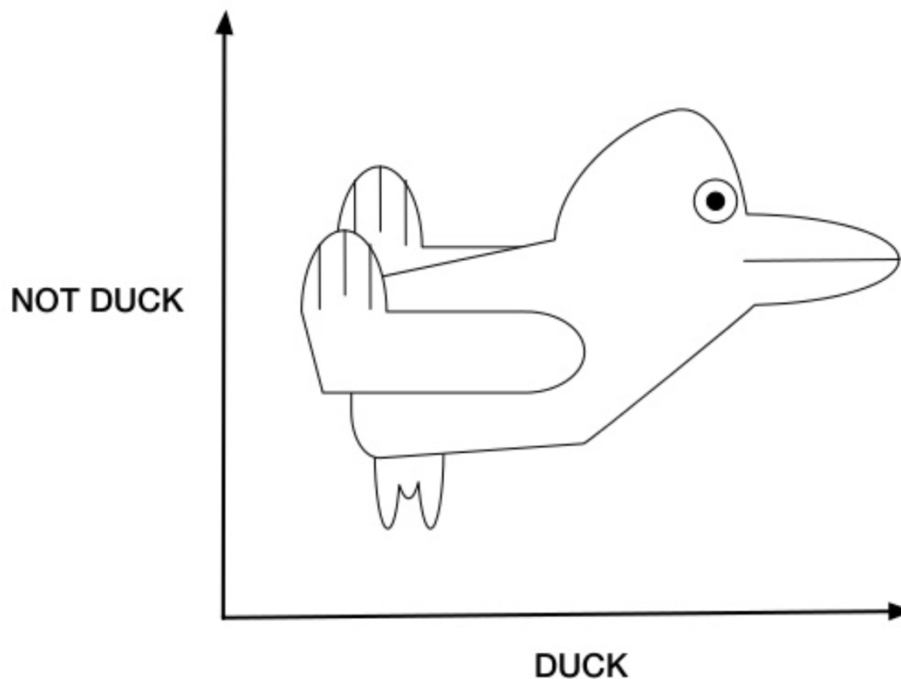


Figure 54. Graph used to illustrate how the ‘Duck Test’ articulates Design Fiction’s inherent ability to deceive.

A further thing that Design Fiction seem to ‘do’ rather well, is provide a safe, flexible and spacious environment for the fertilisation and growth of new ideas. Although not a new idea—Markussen and Knutz, for example, had reported on how they used Design Fiction in this way some time ago (2013)—it’s worth reiterating what the cases studies seem to show in regard to ideation. First of all, when used in workshop-like settings (see 4.7.2, p. 124 and 4.7.3, p. 127 in particular), presenting the rough coordinates of Design Fiction to participants seemed a fruitful and valuable means to unlock creative potentials. While it is impractical, in workshop settings, to ask non-designers to act like designers ‘on demand’, using Design Fiction as a substrate it *is* possible to lubricate the pathways down which participants’ creative juices might flow. Second, in more general terms, Design Fiction is a useful frame to develop and critique concepts. This is evidenced through the various domain-specific insight sections throughout my case studies; if it were not the case, then these sections would be all-but blank. Having said that, unless the use of Design Fiction is managed quite carefully, the nature of future-focused and un-bounded ideation can result in rather expansive ideas (or ‘plausible outsights’, see 4.3.5, p. 90). However, via tactful applications, either in targeted world building (see 4.6.4, p. 114), building on top of existing diegeses (see 4.5.4, p. 104), or strategic Anticipatory Ethnography (see 4.3.4, p. 86) the tendency to be expansive can be managed and subdued appropriately in order to achieve the desired aim. Specific strategies for tailing Design Fictions to specific aims are discussed subsequently in 5.4, *What are the best ways to do that?*

5.3.3 ‘It depends’ is a fair answer; #NoPantryIntended

Considering these possible answers to the question *What can Design Fiction do?*, then perhaps ‘it depends’ is a fair answer after all, it isn’t as pedantic as it first sounds. Based on the research in this thesis I can confidently say that, if you wish to run a workshop with school children, academics, or community activist groups, and you suspect Design Fiction might be a useful technique to help discern and communicate insights about people living in our technologically mediated world—there is a high chance it can work well for you. It *can* do that. Alternatively, and again based on this research, if you need to come up with ideas, refine and development them, in virtually any context involving technology and people—there is a high chance Design Fiction will work for you⁷². It can do that *too*. If you are a design researcher and want to conduct practice-based research, particularly that involves technologies that are inaccessible (either because they haven’t been invented, are too expensive, or you simply don’t have any) then there’s a high chance Design Fiction will function as a great proxy for reality and work well for you. It *can* do that too. Insofar as offering a bounded answer to the question, I fear that doing so would not do justice to the potential of the practice. This is not a unique property of Design Fiction, for example take Philosophy, Religion, Design, or Art. In their broadest possible terms each of these things can do virtually anything, from inspire individuals to encouraging intercontinental war. While I don’t suggest that Design Fiction is directly equivalent, I do believe that by becoming an adept manipulator of its material, one can achieve no end of different ends. Some of these are described in the thesis—and include communication, ideation, research—but there are almost certainly other ways that the practice may be utilised. So, what can Design Fiction do? I can honestly say, with the weight of this thesis behind the sentiment, and with no pedantry for the sake of pedantry, it really does depend!

5.4 What are the best ways to do that?

5.4.1 Contextualising the Question

Based on the position laid out thus far—my tentative proposal for defining what Design Fiction ‘is’ and discussion of what it can ‘do’—it’s clear that a one-size-fits-all articulation of the ‘best’ way to do Design Fiction would be a nonsense. With that said, given my endorsement of Design Fiction as World Building, I believe that adopting that approach as a guiding principle will be productive and negates some of the pre-paradigmatic angst, which otherwise might persist. It’s also worth bearing in mind, as reflected in my methodology’s use of

⁷² And if you’re doing this under the auspices of being a designer, and your name is Cameron Tonkinwise then you *may* be asking ‘all designers do this anyway, so why call it Design Fiction?’ (Tonkinwise, 2014, 2015)—I think this is a fair point, but it’s a rather complex discussion to have—maybe that needs its own doctorate thesis to *fully* unpack.

Constructionism (see 3.3.3, p. 47), I see Design Fiction as a making practice, or, you might say, a craft. To master any craft requires the experience of rehearsal and repetition—and this holds true for Design Fiction too; it’s unlikely that anyone could, based only on desk research, decide to make a Design Fiction and immediately be comfortable and tactile with its material. Although some people, as with musical gifts for example, may have a natural aptitude for it, the majority will have to learn the hard way—and even the predisposed will benefit from rehearsal. So, when considering the ‘best’ way to do Design Fiction, experience will almost always be the most salient factor. It’s also the case that within any given craft movement each practitioner goes about things in their own individual way, this is *also* true for Design Fiction. Notwithstanding these qualifiers, in the following I present a series of questions that are intended to frame how a practitioner may go about using Design Fiction productively, and, in some way, explain the ‘best’ way to use Design Fiction.

5.4.2 Understand, Customise, Iterate

5.4.2.1 Why Design Fiction?

First things first, if you’re considering using Design Fiction—whether that be to *create* one, or to describe something else *as* one—it pays dividends to briefly stop and ask *why*? I don’t think there are any right or wrong answers, but, in order to establish *how* to go about the task of working with Design Fiction, being able to explain *why* it was Design Fiction you chose to work with in the first place is important. It will also quickly sort lazy attempts to use Design Fiction as a way of getting out of doing ‘real’ work from more worthy intentions of doing ‘real’ work using Design Fiction. Ask yourself what you expect Design Fiction to deliver, and in doing so, try to evaluate the underlying intentionality. If you consider a Design Fiction could, arguably, sit anywhere on a spectrum from a corporate vapour world through to a critical piece destined for an art gallery, understanding and reflecting on the underlying intentionality is a vital first step (Coulton and Lindley, 2017b).

Expanding on tangible strategies for how one might understand this intentionality we can take a glance at the widely utilised futures cone (Figure 55). The cone is based around several qualifiers; probable, plausible, possible and preferable. Each qualifier is subjective to some extent, but they are usually considered roughly as follows. *Possible* describes any future permitted by the physical laws of the Universe no matter how unlikely that is (e.g. forward time travel relative to another body made possible by Einstein’s special relativity). *Plausible* refers to futures that are not *as* difficult to imagine, but would not be easy to predict (e.g. the United Kingdom voting to leave the EU and Donald Trump’s election as President of the United States of America in 2016). *Probable* futures are quite likely to happen but not completely certain (e.g. Apple releasing an updated iPhone during 2017). The final qualifier, *preferable*, represents what we would like to happen. It is moveable, and it overlays one or more of the other qualifiers. For example, some preferable futures lie within the realms of the plausible, but outside any notion of the probable.

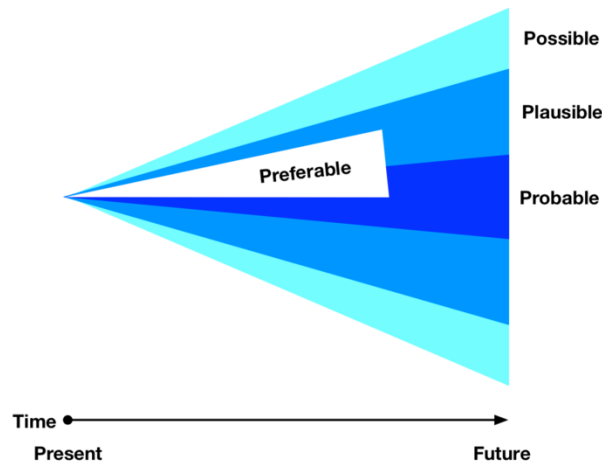


Figure 55. The futures cone, with no representation of the past or of subjectivity.

The cone is relevant here because it can be used as a proxy to map what may or may not be preferable, and hence, what the intention of the Design Fiction’s creator actually is. An alternative form of this diagram adds history to the equation and also represents multiple individual views, as opposed to assuming a unilateral perspective (Coulton, Burnett and Gradinar, 2016).

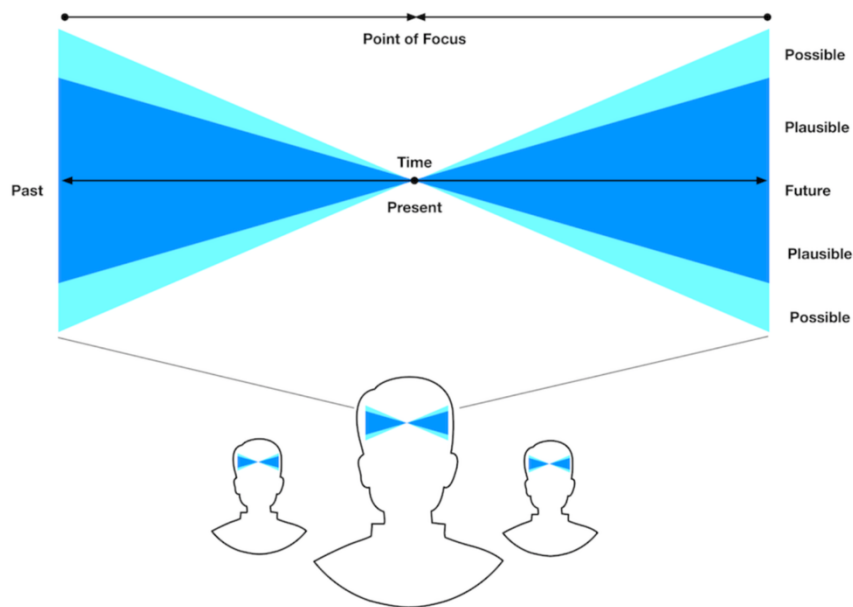


Figure 56. The hermeneutic model of the future featuring individual perspectives, and interplay between future, past, and present.

Contrasting these ways of visualising the future we can consider the how corporate ‘vapour fictions’ (Lindley, 2015a) differ from more critical studies of

the future. Corning's *A Day Made of Glass* and General Motors/Normal Bel Geddes's *Futurama* both overtly portray worlds in which everything—screens, cars, roads, and people—appear to have emerged from the same moment in time. There is nothing old in these worlds, and nothing appears to have any history or patina. These features are representative of the underlying intentionality—to sell products or to suggest at a future world where the company's products are desirable. These predetermined, uncritical, views of the future are best described by the standard futures cone (Figure 55). Contrastingly, a world where awareness of the past brings with it 'mess' and where product lifecycles, interoperability issues, elderly users, malfunctions, data breaches are all everyday realities, are easier to map onto the adapted futures cone (Figure 52). One approach actively suppresses the audience's temptations to ask questions about the mundane reality of the future and promotes visions of the future that sit on 'temporal islands'. The other encourages informed questioning, explores unintended consequences, and appreciates that there is no one version of preferability. Clarifying where *your* project sits on the spectrum of possible intentions will bootstrap any use of Design Fiction and is strongly advised.

5.4.2.2 Who are the Audience?

Informed by an understanding of your intentionality, it's important to cater for your audience, and in order to do that, you need to know who they are. Identifying the audience allows you to understand on what terms they may engage with your use of Design Fiction, and to make decisions accordingly. For example, knowing that my intended audience were HCI researchers, with the Game of Drones project it made sense to present it *as* a HCI research project. Understanding your audience, and catering the Design Fiction accordingly, allows for unique and powerful ways to harness the suspension of disbelief from which Design Fiction tends to derive its value. Part of this exercise relates to the discussion of the previous question too—what are you trying to achieve *for* the audience? Are you aiming to use Design Fiction to communicate? If so, then in what way? Is this for marketing, agenda setting, or to spark debate? Alternatively, is this a research endeavour, and if so, is it to support some other design process or is it to produce original knowledge, or both? Assuming that you are using the world building approach, clearly understanding who your audience is, and how you expect them to interact with your Design Fiction, allows you to plan for creating viable, applicable, and useful entry points. This process requires some balancing between what you are able to deliver, how appropriate individual entry points are for your audience, and the requirement to create a series of entry points that are all consistent with the same diegesis. For example, again referring to Game of Drones, while the inclusion of signage (see Figure 31, p. 119) was unlikely to really appeal to HCI researchers in the same way the ACM SIGCHI abstract did, its role in adding legitimacy and texture to the Design Fiction's diegetic landscape was crucial.

5.4.2.3 Through Iteration can I Make this ‘Better’?

The proverb *the proof of the pudding is in the eating* (which, incidentally has a curious and historic etymology⁷³) refers to the fact that the real value of something can only really be judged by practical experience of it (particularly true with puddings!) Although establishing intentionality and forming that into a bespoke shape apt for one’s audience seem to be demonstrably useful ways to ground applications of Design Fiction, Design Fiction is a pudding you can keep eating again and again. This is certainly true if you are utilising the world building approach, with each entry point that is created you provide yourself with an extra point of reference to then hold every else to account. If a particular aspect of the Design Fiction, or a particular entry point, are problematic either in terms of matching your intentionality, the attributes of your audience, or other factors such as available resources or internal consistency of your Design Fiction world, then you should adapt them accordingly. None of the cases described in this thesis were linear, and hence I wouldn’t expect many Design Fiction processes to be. It may be necessary to change direction, take steps back, and adapt it as the process develops. In the case of *A Machine. Learning* (see 4.4, p. 92) the production of the Design Fiction was constantly reassessed in order to produce a Design Fiction apt for the targeted audience *and* that was achievable; this required a great deal of reflexivity and a willingness to adapt. Entry points such as the flight logs and personal reflections of pilots are aspects of Game of Drones which ultimately were not part of the published work, yet the process of creating them (and later electing not to include them) were essential parts of the overall world building process. Similarly, in the production of Care for a Robot (see 4.5.3, p. 101) it was necessary to direct the participants at the filming stage, to ensure that the direction the interviews were going remained consistent with previous interviews. Building from the first interview I began to identify themes and points of interest that felt like fruitful sites to further develop the diegetic landscape, and hence I would gently direct participants towards those areas (without being overly prescriptive). Electing to not directly employ some entry points (as with the Game of Drones example above) can be a galling process, but may well help result in a streamlined, targeted, and in the end ‘better’ Design Fiction outcome. In summary, the ‘best’ way to do Design Fiction is to be nimble, remember your intention and your audience, utilise the resources and skills you have to hand, have the ability to adapt, and do not be overly prescriptive.

5.5 Further Research and Design Fiction’s Futures

What will become of Design Fiction is an intriguing question, and as Design Fiction *itself* is concerned with the future, it would be absurd not to consider the future of this practice. Through the Fictional Conference on Design Fiction’s Futures (FCDF), I and my collaborators began to explore this very question by using a call for submissions (to the fictional conference) as a sort of crowd-

⁷³ https://en.wiktionary.org/wiki/the_proof_of_the_pudding_is_in_the_eating

sourced factory for Design Fictions about Design Fiction. As that exercise seemed to point out, such inward uses of Design Fiction, particularly when conducted by academics interested in Design Fiction, seem to tend towards ‘meta commentaries’ which, as they become more and more meta, seem to—in my opinion—become less and less practicable and useful (see the quote relating to ‘Nolan Numbers’ 4.7.5, p. 132). This apparent pointlessness, by the way, is not necessarily antonymous with intrigue or fun. FCDFE was intentionally convened with slight spirit of irreverence and anarchy at its core, and there are undoubtedly more careful, nuanced, and ‘serious’ ways to explore Design Fiction’s future. FCDFE’s keynote talk “They’re Made out of Meat: The CHI community and me”, and various paper titles in the proceedings such as “Same Old Design Fictions: Rehashing Tomorrows for Today”, “The downsides of world-building approaches: excluding diegesis from design fiction”, “When bots generate their own speculations: what is left for designers?”, and “Dr Strange futures or: How I learned to stop worrying about the ethics committees and love Design Fictions”, suggest a myriad of jumping off points that, despite their irreverent appearance suggest there’s a wealth of ‘known unknowns’ about Design Fiction that are left to be explored, however, how and when these conundrums will be address is unclear.

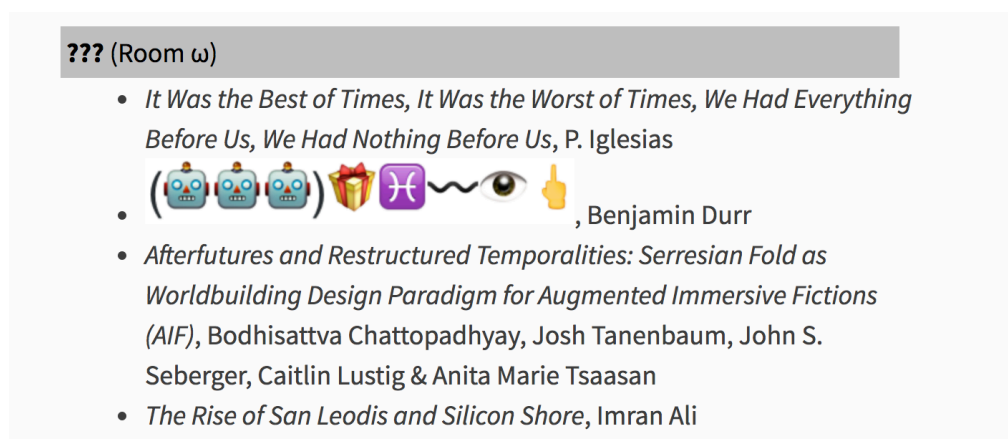


Figure 57. A range of talks from the ??? session of the First Fictional Conference on Design Fiction’s Futures, not held in 2016 (Kirman *et al.*, 2018).

Casting an eye over the history of RtD may provide some clues as to how to more fully get to grips with the minutiae of Design Fiction. Although I did not concur with many of their findings, a research programme based on expert interviews—as Zimmerman, Stolterman and Forlizzi *vis-à-vis* RtD (2010)—may well be an interesting way of expanding on the proposed answers to my research questions and perhaps triangulating, clarifying, and contending my findings. As I argued is the case with RtD, however, in attempting to formalise Design Fiction, the crowd may well be split with one cohort arguing that formalisation would stifle achievement and the other claiming lack of organisation results in no progress. It would also be useful to more comprehensively map the familial history formally, to plot the family tree of Design Fiction, suggest relationships between its cousins, critical design, speculative design, foresight, et cetera. Given the equally shared and contested

spaces, some rigour in this area may help circumvent unnecessary identity crises, and instead allow each constituent to build their own paradigms from a more secure position and without the preoccupation of territorial disputes. If a viable context and methodology could be formulated it would also be interesting to try and develop insights about the impact of particular Design Fictions; i.e. studying them, as it were, ‘in the wild’. This would probably require the use of non-RtD research methods to understand the various pros and cons of using Design Fiction in various circumstances. Reapplying the sense-making lens of Frayling’s categories *one more time*, each of these proposals—that all seem to have some merit and could contribute to an improved understanding of Design Fiction in the future—are instances of Research *into* Design Fiction. While I think these are all worthy approaches, given the nature of the beast—the fact Design Fiction is a practice, a craft—it would be remiss to not do further research *into* Design Fiction, *through* Design Fiction. Clearly, I am not advocating for a raft of doctoral, or postdoctoral, research to try and understand what Design Fiction is, but I do call upon anyone using Design Fiction, and who is able to (often practitioners may be restricted by non-disclosure agreements, or other commercial constraints), to talk about their work and explain what they did, why they did it, and what they have learned from it. This will help a paradigm to mature by galvanising shared ideologies and clarifying contested spaces.

Casting a sideways glance toward Design Fiction’s relationship with HCI, I am intrigued to watch this space. On the one hand, maybe HCI’s inescapable relationship with the proximate future (Bell and Dourish, 2006; Lindley, Coulton and Sturdee, 2017) will strengthen its relationship with Design Fiction, and perhaps Design Fiction’s unique abilities will help fill augment by much contemporary HCI research’s irrelevance⁷⁴ with new semblances of meaning. On the other hand, HCI is a demonstrable and dedicated follower of fashion, and perhaps its flirtation with Design Fiction will be usurped by next year’s flavour of the month, and the parts of the CHI caravan that played with Design Fiction will move on (maybe the current trend non-anthropocentric design marks the start of this). Even if the fashion in HCI research is moving, or has already moved, beyond Design Fiction, the field should not forget the lessons learned during the Design Fiction boom, for it is very likely they’re transferrable.

Something that is definitely *not* going out of fashion is ‘the future’—that it is coming directly toward us is one of the only certainties we all live with. Today’s future, one that an optimist might couch in the massive potential for machine learning to do good and a pessimist might cast as a post-truth pseudo-democratic ecological catastrophe, is a fascinating, awe-inspiring, and breath-taking thing to behold. Comprehending the future is hard though—‘Lemon Difficult’ you might say (see p. 130). Difficult does not mean impossible though, and by

⁷⁴ By irrelevant I refer to the difference in scale of the HCI experiments conducted by technology giants *every day* vs the (usually) tiny scale of academic HCI experiments; the HCI community cannot compete.

utilising the huge scope of what it can achieve, operationalising that potential using the world building approach, and carefully contextualising any given project, Design Fiction can help.

As Marshall McLuhan once said “We look at the present in the rear-view mirror. We march backwards into the future” (1967, pp. 73–74). By building upon the tentative explanations offered in this thesis, a stable and coherent paradigm for Design Fiction could emerge in the near future, and by utilising it we can move beyond the blinkered-and-retrograde stumbling that McLuhan referred to. Perhaps, we can begin to *experience* our possible futures in new ways, hold on to them, and using the diegetic realities that are created by careful use of Design Fiction make more informed choices in the present—which, after all, is the only time and place we can ever actually *be*.



Figure 58. A reflective self-portrait in the rear-review mirror (I guess it was ‘Me. Here. Now’). In this case the reflection suggests that 📱 *that* was a thesis about Design Fiction.

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A THESIS ABOUT DESIGN FICTION

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