



THE UNIVERSITY OF  
**WAIKATO**  
*Te Whare Wānanga o Waikato*

Research Commons

<http://researchcommons.waikato.ac.nz/>

## Research Commons at the University of Waikato

### Copyright Statement:

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand).

The thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- Any use you make of these documents or images must be for research or private study purposes only, and you may not make them available to any other person.
- Authors control the copyright of their thesis. You will recognise the author's right to be identified as the author of the thesis, and due acknowledgement will be made to the author where appropriate.
- You will obtain the author's permission before publishing any material from the thesis.

**Parsing Technology-entanglement for Thick-things**  
The Complication or Complexity of Media and Technologies

A thesis  
submitted in fulfilment  
of the requirements for the degree  
of  
**Doctor of Philosophy in Screen & Media Studies**  
at  
**The University of Waikato**  
by  
**SHAUN NICHOLSON**



THE UNIVERSITY OF  
**WAIKATO**  
*Te Whare Wānanga o Waikato*

2016



## Abstract

Can an interpretive framework untangle distributed forms of technology-enabled media? The thesis develops an interpretive framework to provide an antidote to reckless imaginations that privilege concealment and encourage explanations of technology-enablement as social or automagical. The framework is a response to Latour's call to modify explanations given simply as 'social' and Kittler's observation of software as an unrecognizable layering of linguistic extensions.

The interpretive framework is developed from successive encounters with technology-enablement associated with a particular geospatial use of Augmented Reality. Augmented Reality that accesses photos embedded with geospatial information depends on multiple distributed technologies ranging from smartphones to satellites. This contemporary form of technology-enabled media is demonstrated by a Panoramio geospatial layer of tourist photos accessed using the software product Layar. The encounters are with an image collection, WIFI router, 3G cellular data network, iPhone, geospatial location service and Layar. These enabling technologies have been gathered and inspected for human and nonhuman agencies during project encounters that followed an ethnographic approach. A dialogue with technology practitioners informs the analytical engagement with Augmented Reality to provide an alternative vocabulary for theoretical access to those vastly distributed and indescribable technology-enablers.

The framework is developed through successive propositions. The encounters pursue the trajectory of a digital image from a technology-enabled visual representation that can be created or consumed with ease to distributed image collections that operate as a contemporary site of interoperability. Photos are transformed in proposition 1 from a visual surface to a realm of specificity that is a stratified and expansive construction of exchangeable data. The second proposition establishes technologies as constructed from atomic building blocks that are combined in either complicated or complex formations. The second proposition asserts that it is necessary to distinguish between complication and complexity. Propositions 1 and 2 are extended by a debate between respective positions of an extremely flat ontology and an expansive materialism represented by Bryant, Barad, Latour and Bennett. The flat ontology is rejected and a thick account of things is asserted as a position that better accounts for the entanglement of humans and nonhumans interoperating amongst a synthetic ecology of media technologies. The third proposition is that the technology-enablement of media is a complicated or complex form of technology-entanglement. The thesis demonstrates this interpretive framework before concluding with a 'how-to' that guides researchers adapting this methodology for their own projects.



### **Acknowledgments**

I am indebted to my supervisors Professor Dan Fleming and Associate Professor Craig Hight who provided years of guidance. They tortured their minds with my raw material and were constructive with their red pens while I revised each draft.

As chapters in the thesis reveal, I owe much to the contribution of those anonymous participants I interviewed who are mentioned throughout chapters as informants. Without their sharing of insights, mine would have been limited. Likewise, I am grateful to Jenny Odell and Corinne Vionnet for the contribution of their creative projects and their support for the reproduction of their artwork in this thesis.

Many colleagues and friends have also provided continued support during the years of this project. I have been often asked about progress (something that is nearly impossible to track let alone explain) or provided encouragement and direction to help resolve whatever matters were puzzling my mind at the time.

I am most thankful to Jenelle who was forever tolerant of my piles of paper and years of distraction while writing was a priority never greater than her but something that was always in front of both of us like an overstaying guest.



# Table of Contents

<b>Thesis Structure .....</b>	<b>xiii</b>
<b>Prologue - The Technology of Macondo .....</b>	<b>xv</b>
<b>Introduction .....</b>	<b>1</b>
Intentions .....	1
Enquiry-driven .....	6
An Ethnographic Approach .....	7
Interpretive and Neither Quantitative Nor Mixed Method .....	8
Literature Sources .....	10
Technology and Technologies .....	10
Sociological Conditions .....	16
Technology-enabled Spaces .....	18
Methods .....	21
Ethnographic Methods and Techniques .....	22
Industry Informants .....	28
Transforming Encounters into Written Text .....	34
Chapter Outline .....	43
<b>Chapter 1. The Migration Between Place and Information Spaces .....</b>	<b>47</b>
1.1 Sites and Scenes of Technology-enablement .....	47
Encounter I An Imagined South Seas Arrival .....	49
1.2 Picture This, A Distribution of Sites & Scenes .....	55
Encounter II An Informational View of Atiu .....	58
Encounter III Digital Gaze .....	63
1.3 Augmented in Atiu .....	66
Encounter IV A Layered Place .....	67
Encounter V Range as a Software Setting .....	69
<b>Chapter 2. From Media to the Study of a Media System of Systems .....</b>	<b>73</b>
2.1 A Stratification of Media Studies .....	75
2.2 A Revised Spatial Reasoning .....	88
Encounter VI Corinne Vionnet’s Photo Opportunities .....	88
Encounter VII Jenny Odell’s Travel By Approximation .....	94
2.3 The Ethnographic Place of M.COM/DO .....	99
<b>Chapter 3. An Indescribable Distributed Materialism .....</b>	<b>107</b>
3.1 A Subterranean View of M.COM/DO .....	108
Encounter VIII A Google Street View of Things .....	111
Encounter IX Darknet: A Glocal Network .....	113
3.2 An Overhead View of M.COM/DO .....	116
Encounter X Witnessing Assisted GPS .....	123
Sketch: A Latitudinal View of Digital Splace .....	125
Sketch: A Longitudinal View of Digital Splace .....	129
3.3 A Moment of Complication .....	134



<b>Chapter 4. Humans &amp; Nonhumans as Collectives of Objects or Things .....</b>	<b>151</b>
4.1 Thick or Flat and Possibly Entangled .....	151
4.2 Digital Splaces Inhabited by Thickened Things .....	162
Encounter XI A Thickened Description of a Thing.....	166
4.3 Parsing Technology-entanglement for a Flat Object or Thick Thing.....	171
Encounter XII An Interpretive Teardown.....	175
<b>Chapter 5. Interpreting the Thick-things of Technology-entanglement.....</b>	<b>183</b>
5.1 A Preference for Thick Things .....	184
Encounter XIII A Momentary Change from Complication to Complexity.....	202
5.2 A Vitalist Complexity .....	206
Encounter XIV Parsing Articulated Naturality Web .....	211
5.3 Eye-wear or Eye-ware .....	217
Encounter XV The Sight-lines of Hand-held Screens .....	218
Encounter XVI An Emperor's New Clothes Materialism .....	225
5.4 A 'How-to' for Parsing Technology-entanglement.....	227
<b>References.....</b>	<b>231</b>
<b>Appendix 1.0 - The Technology of Macondo .....</b>	<b>243</b>
<b>Appendix 2.0 – Qualitative Coding of Interview Material .....</b>	<b>249</b>
Appendix 2.1: Interview Protocol .....	251
Appendix 2.2: Guideline for the Technology Diagram Activity.....	253
Appendix 2.3: Raw Quotations from Initial Coding .....	255
Appendix 2.4: Raw Phrases & Terminology from Invivo Coding.....	273
Appendix 2.5: Emic Categories from Secondary Coding.....	279
Appendix 2.6: Analytical Memos .....	287
Stages of the Coding Process .....	287
Analytical Memo 1: The Human Construction of Technology .....	288
Analytical Memo 2: Complicated or Complex? .....	288
Appendix 2.7: Secondary Simultaneous Coding of Complication or Complexity .....	291
<b>Appendix 3.0: Encounters and Observations .....</b>	<b>301</b>
Appendix 3.1: Reciprocal Relations.....	302
Appendix 3.2: Sites Amid a Broad Collection of Things .....	303
Appendix 3.3 Encounters & Supporting Evidence .....	304
Appendix 3.4: The Inadequacy of a Network of Associations.....	305
Appendix 3.5: Encounters and Observations at Multifaceted Sites .....	306

## Table of Figures

Figure 1 - Hand-held Augmented Reality .....	1
Figure 2 - Reciprocal & Migratory Relations Between Place & Information Spaces.....	11
Figure 3 - An Emergent Network of Associations .....	24
Figure 4 - Shining Green, Blue Sea and Alluring Clearness (Maina, Cook Islands).....	48
Figure 5 - View from Interior of Embraer Bandeirante.....	49
Figure 6 - Motionless and Forlorn Palms 2010 .....	50
Figure 7 - Public Address On-screen Obstruction .....	52
Figure 8 - Journal Entry for Arrival at Atiu .....	56
Figure 9 - Panoramio Page for User Account neuseeland77 .....	57
Figure 10 - Suddenly Set-down on Atiu.....	58
Figure 11 - An Informational View of Atiu .....	59
Figure 12 - Arrival and Disembarking.....	61
Figure 13 - An Informational View of Place Revealed by a Digital Gaze .....	63
Figure 14 - A Conventional and Singular View of a Photographer's Gaze .....	64
Figure 15 - Hand-held Augmented Reality of a Photo Collection on Atiu .....	67
Figure 16 - Software and Geographical Range.....	69
Figure 17 - © Corinne Vionnet; Stonehenge, 2007, from the series Photo Opportunities ...	88
Figure 18 - Constructing a Re-photographed Landmark.....	91
Figure 19 - Photoshop Integration at Sequoia National Park .....	94
Figure 20 - Jenny Dines at Miners Diner .....	95
Figure 21 - Google Street View of Sam's Bagels and Bennett's Grate on Cold Spring Lane	111
Figure 22 - Router Parthood with Sticker.....	114
Figure 23 - Plotting Location By Network Connectivity .....	127
Figure 24 - Technology Enablers of Augmented Reality .....	131
Figure 25 - Results of an iPhone Tear-down .....	175
Figure 26 - A Very Human Component of a Thick-thing .....	177
Figure 27 - Mis-placed iOS Surveillance Due to Device Inaccuracy .....	179
Figure 28 - An iPhone Mock-up of Articulated Naturality Web.....	211
Figure 29 - A Schematic of Hand-held Screen Use in St Peter's Basilica 2013.....	219
Figure 30 - A Rendition of Eye Fixation with Google Glass .....	224
Figure 31 - Holographic Phone with Meta Spaceglasses .....	225
Figure 32 - Augmented Reality Technology .....	253
Figure 33- Network Diagram of Simultaneous Coded Quotes.....	299
Figure 34 - Migration Between Place & Information Spaces .....	301
Figure 35 - Reciprocal & Migratory Relations Between Place & Information Spaces.....	302
Figure 36 - Distinct and Interoperable Sites.....	303
Figure 37 - Encounters with Interoperable Actants.....	304
Figure 38 - An Emergent Network of Associations .....	305
Figure 39 - Multifaceted Sites .....	306



## Table of Tables

Table 1 - Ten Sample Data Records from iPhone Location Cache .....	126
Table 2 - Initial Quotations.....	255
Table 3 - Advanced Constructs.....	279
Table 4 - Complex.....	281
Table 5 - Complication .....	283
Table 6 - Building Block .....	284
Table 7 – Enabling .....	284
Table 8 – Newish .....	286
Table 9 - Ubiquitous .....	286
Table 10 - Simultaneous Coded Quotations .....	293



## Thesis Structure

The thesis begins with a scene-setting prologue. A counter-factual tale of technological development is established by drawing on characters and events from the novel *One Hundred Years of Solitude* by Gabriel Garcia Marquez. The successive periods of development transform the village of Macondo to Alberto Fuguet's transnational location McOndo and finally a place of contemporary media and technologies I name M.COM/DO.

The introduction is prefatory and explains the research project. The project intentions, situating in relation to literature sources, ethnographic approach, role of informants, selection of encounters and their textual transformation into this thesis are all introduced with reference to their occurrence in thesis chapters.

The thesis continues with chapters one to five. The interpretive framework for untangling vastly distributed and indescribable media and technologies is developed from successive encounters with the interoperable technology-enablers of Augmented Reality. This occurs in dialogue with informants who are technology practitioners characterised as contemporary descendants of the Macondo gypsies. The theoretical perspectives of Latour, Bennett and several others are tested against the input of encounters and informants. These chapters are fully introduced in the outline at the end of the introduction.

The thesis finishes with references and three appendices where the full tale of technology-enablement in Macondo is presented, coding of interview material is developed and the supporting evidence gathered during encounters is explained.



## Prologue - The Technology of Macondo

The citizens of Macondo<sup>1</sup> were often interrupted by visiting gypsies and Jose Arcadio Buendía<sup>2</sup> was fascinated by their startling discoveries. The gypsies knew only their own language and were handsome specimens with oily skins and intelligent hands whose dances and music sowed a panic of uproarious joy through the streets. They brought on one visit the multi-use machine that could be used at the same time to sew on buttons and reduce fevers and a thousand more inventions so ingenious and unusual that Jose Arcadio Buendía must have wanted to invent a memory machine so that he could remember them all. In an instant they could transform the village.

Flash-forward to a contemporary time and place I name m.com/do. There I am, connected with my very own memory machine that has converged with a thousand other inventions so ingenious and unusual as to become an automagical multi-use machine. I am connected via layer upon layer of technology-entanglement to complicated or complex thick-things.

Here I am, connected with others too—some human, some not—agents of technology like the visiting gypsies. They have shiny skins and intelligent brands whose rituals and cultural artefacts seed uproarious joy. The visiting gypsies first arrive in Marquez's village of Macondo (Marquez 2009) but the contemporary period of m.com/do is a time of connectivity distinct from Marquez's development of Macondo as a place of isolation and solitude. We're all connected in m.com/do but not directly to each other. We're networked by smartphones. The inhabitants of m.com/do find themselves tangled in their webs, confused by the complication or complexity provided by those gypsies.

What would the fascination of Jose Arcadio Buendía reveal if he was to embark upon this enquiry, this inquisitive project—an exploration of m.com/do—with his characteristically feverish activity? What would be revealed if Buendía's fascination was there to greet the technology-enabled pipes, drums, and jingles of a contemporary clan of gypsies with smartphones in their intelligent hands? What would be revealed if the contemporary descendants of those gypsies were to explain, welcoming us back to their camp site once

---

<sup>1</sup> Macondo is the fictional setting of Marquez's novel *One Hundred Years of Solitude* (Marquez 2009) and later subverted as McOndo by a new era of Latin American writers such as Fuguet. The name of those fictional locations is reinvented in this thesis to reinforce successive transformations from: village to metropolis (Macondo); village to trans-national diaspora, media and brands (McOndo); the contemporary information spaces and places enabled by interoperability (m.com/do).

<sup>2</sup> Buendía is a character from *One Hundred Years of Solitude* (Marquez 2009).



the stagecraft of pipes, drums, and jingles had died down, to exchange with us tales of their technologies and their magic?

With a sense of wonder that epitomises Buendía's fascination I ask the descendants of those Macondo gypsies "what are your technologies?" and I stage encounters on open grass with smartphone in hand and Augmented Reality held up high interrupting my field of view, altering my point of view. The following is a summary of the tale *The Technology of Macondo*<sup>3</sup> that is extracted from Marquez's *One Hundred Years of Solitude* (Marquez 2009).

\* \* \*

Macondo was a village of twenty adobe houses built on the bank of a river of clear water that ran along a bed of polished stones which were white and enormous like prehistoric eggs. Every year during the month of March a family of ragged gypsies would set up their tents near the village and with a great uproar of pipes and kettledrums they would display new inventions. First they brought the magical irons. Those magnets were introduced: "things have a life of their own" the gypsy Melquiades proclaimed with a harsh accent, "it's simply a matter of waking up their souls". Jose Arcadio Buendía whose unbridled imagination always went beyond the genius of nature and even beyond miracles and magic thought that it would be possible to make use of that useless invention to extract gold from the bowels of the earth. Melquiades, who was an honest man, warned him: "It won't work for that".

The gypsy returned and gave Jose Arcadio Buendía the astrolabe, the compass, and the sextant. Jose Arcadio Buendía spent the long months of the rainy season shut up in a small room that he had built in the rear of the house so that no one would disturb his experiments. He became an expert in the use and manipulation of his instruments. He conceived a notion of space that allowed him to navigate across unknown seas to visit uninhabited territories and to establish relations with splendid beings without having to leave his study.

Suddenly and without warning his feverish activity within the study was interrupted and replaced by a kind of fascination. He spent several days as if he were bewitched and softly repeating to himself a string of fearful conjectures without giving credit to his own understanding. Finally, one Tuesday in December, at lunchtime, all at once he released the whole weight of his torment. The children would remember for the rest of their lives the august solemnity with which their father, devastated by his prolonged vigil and by the wrath of his imagination, revealed his discovery to them: "The earth is round,

---

<sup>3</sup> The tale has been extracted from *One Hundred Years of Solitude* (Marquez 2009) and is presented in full in appendix 1.

like an orange." Usula lost her patience with her husband, "if you have to go crazy, please go crazy all by yourself!" she shouted, "but don't try to put your gypsy ideas into the heads of the children". "Incredible things are happening in the world" Jose said to Usula, "right there across the river there are all kinds of magical instruments while we keep on living like donkeys".

Those who had known Buendía since the foundation of Macondo were startled at how much he had changed under Melquiades' influence. That spirit of social initiative disappeared in a short time, pulled away by the fever of the magnets, the astronomical calculations, and the urge to discover the wonders of the world. "God damn it!" he shouted. "We'll never get anywhere" he lamented to Usula. "We're going to rot our lives away here without receiving the benefits of science".

On a warm March afternoon Jose Arcadio Buendía interrupted the lesson in physics and stood fascinated again, with his hand in the air and his eyes motionless, listening to the distant pipes, drums, and jingles of the gypsies who were coming to the village once more announcing the latest and most startling discovery of the sages of Memphis. They were new gypsies, young men and women who knew only their own language, handsome specimens with oily skins and intelligent hands whose dances and music sowed a panic of uproarious joy through the streets, with parrots painted all colors reciting Italian arias, and a hen who laid a hundred golden eggs to the sound of a tambourine and a trained monkey who read minds and the multi-use machine that could be used at the same time to sew on buttons and reduce fevers, and the apparatus to make a person forget his bad memories and a poultice to lose time and a thousand more inventions so ingenious and unusual that Jose Arcadio Buendía must have wanted to invent a memory machine so that he could remember them all. In an instant they transformed the village. The inhabitants of Macondo found themselves lost in their own streets and confused by the crowded fair. Gypsies had arrived once again.

The gypsies were not the same acrobats and jugglers that had visited before. Unlike Melquiades' tribe, they showed very quickly that they were not heralds of progress but purveyors of amusement. Even when they brought the ice they did not advertise it for its usefulness in the life of man but as a simple circus curiosity. This time, along with many other artifices, they brought a flying carpet. But they did not offer it as a fundamental contribution to the development of transport, rather as an object of recreation. But Jose Arcadio Buendía did not even look at it. "Let them dream" he said, "we'll do better flying than they are doing and with more scientific resources than a miserable bedspread".

\* \* \* \*

The literary place of Macondo has been recast into a tale of technology-enablement. The tale is an account of progress that spans from a past when the place was so new you were required to point to an inevitable but unknown future of development: a time of improved flight as a result of increasing scientific resources.

Progress was welcomed each March when the gypsies arrived in Macondo. Progress was also an impairment in Macondo. Buendía was hampered by his fascination: standing with his hand in the air and his eyes motionless. Progress hindered the residents as they found themselves lost and confused in their own streets. And progress was infectious. The gypsies brought a thousand inventions so ingenious and unusual that Buendía must have wanted to invent a memory machine. The residents of Macondo appear to have been seldom unaffected and often their state of being was negative or positive as they swung between hindrance and impairment or curiosity and expectations of utility.

This tale of technologies in the village of Macondo is a counterpoint to assumptions of technology-enablement as providing an unaffected simplicity and inevitable progress. In the village I see the evolution of a tangled web of expectation and deceit. Even the honest declaration by the first gypsy Melquiades that the magnet "won't work for that" melded with Buendía's disbelief in the honesty of gypsies. The entangled relationships of provider and recipient of progress contravenes a principle of simplicity. The entangled web of expectation and deceit contravenes the principle that simplicity is freedom from deceit or guile and otherwise demonstrating a normality. The objects of progress are seemingly simple when considered inanimate. A metal ingot is hardly intricate and divisible into parts but two metal ingots that make beams creak from the desperation of nails and screws trying to emerge demonstrate that a magnet is more than the simplicity of two metal ingots. A magnet includes a positive polarity that conjures lost objects and a negative polarity that makes nails and screws writhe in desperation. The accompanying explanations of those magnets transform the attraction or repulsion of a magnetic charge to a positive or negative state of being which is far from a neutral unaffected state. The simplicity of opposing polarities has become tangled with expectations and intentions.

The magnets are not simple. This example of two magnetised ingots suggests multiple relations that exceed their physical state. There is a cacophony of objects and things caught in their range and subjected to the special polarity of their magnetic charge. The magnets are not contained by the materiality of the ingots because they have a range unrelated to

their magnetic charge. Their range is as much suggested by their potential as determined by their magnetism and proximity to other objects. The magnets range is suggested by its potential influence, which is that ability to conjure or require an object to writhe. The magnets potential influence is a range extended by humans who manoeuvre those magnetic objects in relation to expectations and to exert intended influences. Human expectations are potentially informed by magnetic charges just as they may very well be informed only by an expectation that these magnets have the potential to induce behaviour changes. My analysis suggests these magnets of Macondo are comprised of many related parts. This division of parts is between objects and space as manoeuvred by humans with their guile and influence. This is no ordinary symbiotic combination of human user and technological device and it is a principle aim of this thesis to understand that relationship.

The village of Macondo has a more recent equivalent. Fuguet explains McOndo as a global location of urban freneticism featuring McDonalds, Macs and Condos bursting from multiple media such as film, music and television as a hectic and unmanageable experience that is a complex transnational experience (Fuguet 2001, pp. 68-69). Fuguet transports us to a site of McOndo aboard the contemporary equivalent of a magical carpet ride. Fuguet's contemporary magical carpet ride was foretold by Buendía in Macondo during that golden era of civic development when Jose Arcadio Buendía foresaw with brazen insight an improvement to transportation beyond what the gypsies' magical carpet could provide. Fuguet (2003) exploits modern technology when he imbues Los Angeles with his sensibility of a globally distributed urban experience. Fuguet describes Los Angeles as a location that's first impression differs depending on your arrival time because 'Elei' seduces its visitors with a confusion of site, scene and screen. Fuguet's autobiographical character Beltrán Soler Niemeyer touches down having travelled by a technology enabled by scientific resources that has surpassed what was once imagined speculatively by Buendía in Macondo that day he foretold of air travel that would better a miserable bed spread.

It's best to arrive in Los Angeles at night. If you get there during the day, it's too easy to see the truth: the city doesn't have angels, dreams, or stars. But if you arrive at night, the idea of sleeping vanishes, no matter how tired you are, and you feel—if only for a moment—privileged. You feel that it's not just by chance that you're here, where movies are born.  
(Fuguet 2003, p.53)

Buendía would not have been seduced. He made personal progress with each visit of those

gypsies and eventually developed a criticality that evaded the impairment of initial fascination. Buendía could differentiate between objects of recreation and progress that could contribute to community development.

There is another difference between Macondo and McOndo and that is the absence of magical items in the contemporary global village of McOndo. Niemeyer's carpet is an interior of a Holiday Inn overlooking the 405 freeway in Los Angeles. His carpet is covered in Twinkie crumbs and pumpkin seeds (Fuguet 2003, p.4). Fuguet's realism is not a magical one of Macondo and his carpet is a woven fibre we could all walk on. His realism was a reaction to the excessive expectations that Latin American literature predominantly could and should demonstrate magical realist traits, a legacy Fuguet considers a curse (Fuguet 2001, p. 69). Fuguet's reaction was a critical one prompting representations of contemporary trans-american culture that acknowledge by recognition and conscious recirculation<sup>4</sup> the currency of media. Fuguet's equivalent to Marquez's village site of Macondo is the non-existent critical site McOndo which was founded during a period of increasing awareness of globalisation. Fuguet's McOndo is a place foretold by Buendía: a place with more scientific resources than a miserable bedspread.

Fuguet continues his contemporary antidote to Marquez's magical realism. His character Niemeyer narrating a memory of his life prompted by the movies compiled in a list while walking that unmagical carpet in that Van Nuys hotel. Niemeyer's narration was an exercise motivated after a chance encounter with Lindsay while en route:

(Lindsay) "...I don't go out much, and when I do go see a movie it's always a disappointment."

(Niemeyer) "The past was better?"

(Lindsay) "No, the past was worse."

(Niemeyer) "I agree. But maybe it's those old movies that were better."

(Lindsay) "I don't think so. That's the point of Lorenzo Martinez's book: those movies weren't important for everybody, but they meant something to you."

(Fuguet 2003, p.49-50)

Marquez's attention to a golden era of a village community geographically isolated by a swamp in their collective solitude has been updated, superseded, by an individual's

---

<sup>4</sup> This notion of recirculation is considered in section 2.1 through the work of Castells, Appadurai and Corner.

contemporary relationship with sites and scenes in the work of Fuguet. Location has become a place that is a hybrid of site, screen and scenes: a liminal place transformed by night and day, with such a persuasive influence that if you arrive at dawn you leave the airport feeling deprived having arrived "full of faith, and by the time you leave the terminal the sun is in your eyes, along with the feeling that someone's cheated you" (Fuguet 2003, p.53). Who said Fuguet's places of McOndo don't demonstrate a technological touch of magic amid layered realities?<sup>5</sup> Fuguet's village is globalised, his household another hotel in an itinerary extended over years of movement and life events punctuated by what is seen on screens. Fuguet's village is globalised but *not* global, or at least, not as global as contemporary universal addressing of places and information spaces allows.

That was then and this is now. Perhaps much has changed and something, some things, have remained the same. Let us consider the universal address of another place, an information space I name m.com/do. Fuguet's account of technology-enablement by travel and screens serves as an intermediary account between Macondo and the contemporary place of information spaces m.com/do.

The contemporary mythical place of m.com/do is an experienced place. We can now stand with our very own multi-use machines, standing at an address that is at once unique and universal. The address is recognisable as a mobile web address because of the conventions of 'm' and 'com' with the '/' denoting a functional resource to 'do' something. The discrete machine readable conventions of 'm' and 'com' and '/' combine into a human recognisable address that began as a machine parsable uniform resource locator and is now commonly known by acronym as a URL.

There I was with my very own multi-use machine, a smartphone, accessing alternate layers of another place. Already location is becoming confused because the other place was the island of Atiu which was the actual place I stood, the space I inhabited, as I stood there in m.com/do connected to alternative layers of Atiu. I was augmented in Atiu. The experience of augmentation is an experience not limited to the island of Atiu as I connect at that time to layers of Atiu and continue to remain connected once I have travelled farther afield. Perhaps I have gone or perhaps traces of my presence remain. The accumulating evidence of my stay are gathered and used—the photography and journals, those hallmarks of a

---

<sup>5</sup> The critical attention to automagic amid stratified realities is expanded in the introduction.

conventional ethnography—but principally the interest of this project is in the connectivity between place and information spaces as enabled by internet technologies and as demonstrated by the technology-enablers of Augmented Reality. Photography becomes a data source situated amid technological processes and the recirculating media that augments reality.

There I was, connected with my very own multi-use machine. Here I am, still connected. Others connect too. We're all connected. But not directly to each other. This isn't an architectural observation or an interest in network typologies such as peer-to-peer or point-to-point. What is of interest is the *encounters with evidence of an expansive form of connectivity* that supports technology-enablement. The observations from m.com/do are encounters with connectivity between *seemingly independent but interoperable media technologies*. The nature of those encounters is elaborated and explained in chapters of the thesis but first they require brief introduction. The encounters are with images, screens, embedded geospatial data, infrastructures such as network equipment, satellites or location data services, and devices that are hand-held or eye-ware. The encounters with technology-enablement that are found in the thesis are:

- An account of a South Seas arrival mediated by imagination, imagery and screens in section 1.1.
- The spatial analysis of an image collection in section 1.2 to present an informational view of Atiu.
- An account in section 1.3 of using Augmented Reality and the examination of range as enabled by an Augmented Reality software setting.
- A creative project creating an aggregate image from a collection of landmark photos in section 2.2.
- A creative project taking a virtual road trip that navigates using user generated content in section 2.2.
- An infrastructural thing re-found by Google Street View in section 3.1.
- A network router's componentry in section 3.1.
- The witnessing of 'assisted GPS' as a location service in section 3.2.
- A thickened description of a thing in section 4.2.
- An interpretive iPhone tear-down in section 4.3.
- An account of astrodynamics to reveal the vulnerability of the GPS satellite constellation in section 5.1 once complication is surpassed by complexity.
- A critique of Articulated Naturality as a proposed but imaginative form of

Augmented Reality in section 5.2.

- A comparison of hand-held screens and eye-ware in section 5.3.
- A speculative Augmented Reality use-case in section 5.3 for a holographic phone.

These encounters with interoperable technologies are accompanied. The contemporary descendants of the Macondo gypsies are never far from the discourse of this thesis and they contribute their voice to inform the dialogue between encounters, researcher and theoretical perspectives. Their presence is known despite their absence. I am aware of their presence and my investigation seeks their input. My investigation suggests that the technologies and magic of Macondo, the magnets and other devices such as the multi-use machine, have evolved during the intervening period between Macondo and m.com/do. The many related parts of these technologies have become something more, explain the contemporary descendants of the Macondo gypsies:

I guess it's some advanced constructs so things that people make, to do something-to suit some role.

(quote 1)<sup>6</sup>

Technology is most often used with advanced things that appear to be, I was going to say technological but, appear to be complicated or complex.

(quote 9)

Sometimes it's a synergistic thing so that we're able to do more than we could imagine or more than we imagined we would with the tool or technology and hopefully it leads on to better and more optimised technologies.

(quote 17)

It's generally things that I guess we kind of consider to have some novelty and perhaps the workings of it are sort of complex beyond what simple inspection could reveal.

(quote 47)

A curiosity that might be prompted by their comments is what advanced things can these gypsies possibly provide with these technologies? Except, a curiosity-driven form of futurism will not be attempted because this project is concerned with contemporary

---

<sup>6</sup> This notation denotes coded quote 1 from interviews with technology practitioners and later the abbreviated notation IV is used to designate in vivo coded phrases. The participation of these informants is introduced in the methods section of this introduction. Qualitative analysis and coding techniques are explained and presented in Appendices 2.0 - 2.6.



technology-enablement. The methods of this project provide encounters that generate evidence of technology-enablement. The encounters in this thesis present a range of media and technologies that are enablers of Augmented Reality. Instead, a curiosity activated within chapters of the thesis is what might be imagined by Buendía's reckless imagination? The reckless imagination of Buendía is a characterisation of an *imaginaire* for automagical things. The contemporary descendants of the Macondo gypsies return throughout the thesis to fuel or quell the recklessness Buendía demonstrates.

A critical perspective and characterisation of technologies, their users and developers has been established by the tale The Technology of Macondo. Another location that is a contemporary equivalent called 'm.com/do' has been founded. The role of Buendía and the gypsies in forthcoming chapters of the thesis is to provide an occasional appearance, a reminder, as a counterpoint to analyses and the thickening of interpretation. The eras of Macondo, McOndo and m.com/do remind that this examination of media technologies is occurring within a broader sociological frame of technological development that I remain open to as *progress* or *imaginative*.

The complete tale of the Technology of Macondo is reproduced in appendix 1 and the relevance of m.com/do as ethnographic place is explained in section 2.3. The following introduction explains the intentions of the project, key sources from the literature, methods used, industry informants and transformation of encounters into this thesis.

## Introduction

Be pretty specific or at least specific about what you are claiming to know.

(quote 27)

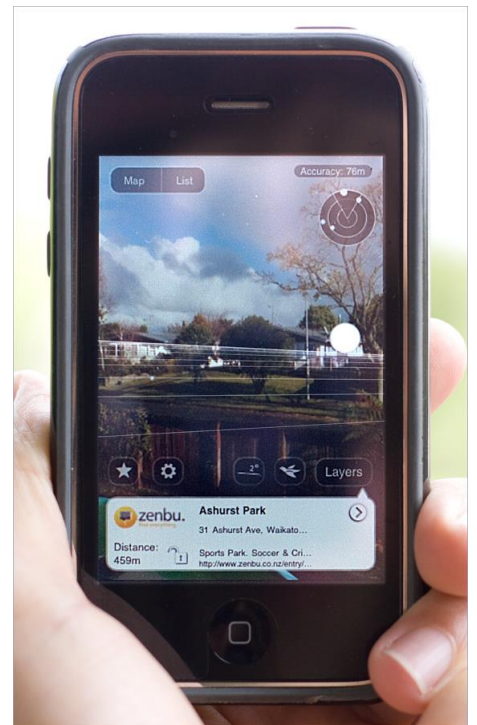
### Intentions

The intention of this project at the outset was to examine particular media technologies as specific things that emerge when people use technology-enabled practice to create a sense of place. Place is encountered during travel and the thesis begins in chapter one with an account of a contemporary sense of mobility that is a movement between corporeal spaces and information spaces. Place is also accessed via the connected media and technologies that enable Augmented Reality. Intentions shifted as encounters demonstrated the interplay between geographical places and media as entangled with the data and infrastructures of global media technologies.

Thus the project examines the creation and consumption of digital artefacts that are, arguably, cultural entanglements. This project's attention to 'new' Media Studies is explained (in chapter two) as a study of global media technologies that are inherently computational and that extensively interoperate. This project examines the interplay between user generated content as a particular derivative of technology-enabled practice that integrates digital artefacts with a geographical space by way of embedded geospatial data. An example of this type of technology-enabled practice is a photo collection created on the South Pacific island of Atiu<sup>7</sup> with a Sony HX5V camera that features a chip for receiving Global Positioning System (GPS) data for embedding in each image file.

Figure 1 - Hand-held Augmented Reality

A simple explanation of Augmented Reality technology is that digital content can be created through specialised technical practices that connect an information space with



<sup>7</sup> A quite simple explanation for why the island of Atiu features in this thesis is that all of the necessary technology-enablers were operating on that island whereas they were not at other locations.

a geographical place. Figure 1 shows the Augmented Reality browser software 'Layar' on an iPhone. The on-screen display shows the New Zealand search engine 'Zenbu'<sup>8</sup> identifying proximity, direction and information about a local place of interest. Information and imagery is layered in real-time over the preview from the iPhone's camera. As demonstrated in figure 1, mobile internet technologies can extend the association between geographical places and information spaces creating a cyclic, and possibly recursive, connection by presenting digital content layered into a visualisation of place.

Those general project intentions carry an intended criticality. The criticality first manifests in chapter one, where the specificity of technology-enablement is examined. Chapter two draws on theoretical perspectives from Media Studies and the creative perspectives of Odell and Vionnet to relocate the corporeal experiences from chapter one to a technology-enabled space I name *m.com/do*. A critical framework for reinterpretation of technology-enabled media continues to develop in chapters three through to five as the reconsideration of the complication and complexity of those layers of technologies and media suggests what I call technology-entanglement. Chapters three to five continue to develop this criticality as a framework that reframes the technology-enablement of Augmented Reality as a technology-entanglement reliant on formations that are *either complication or complexity*. The nature of a cyclic loop between place and information space by way of Augmented Reality is revealed as a tangle of complicated or complex layers of technology and digital artefacts.<sup>9</sup>

The relevance of the phrase 'technology-enabled practice' to this project is partly due to the particular approach that has arisen from my professional insights as a technology practitioner.<sup>10</sup> This approach informs an interpretive agenda<sup>11</sup> that attempts to locate a renewed criticality focused on the specificity of constructed technologies. Informants and encounters with technologies contribute to the development of the critical framework for this interpretive agenda. The interpretive agenda is to descend a 'rift' which will be defined in this introduction and to delve beyond the user interface of these technologies into black-boxes.

One site to look for this rift is a technology dependent mutual exchange: a shared belief

---

<sup>8</sup> A focal point for the thesis is the use of the Panoramio layer of photos on the iOS App Layar on Atiu. However, there are many more information layers and Zenbu is one of many alternatives that demonstrates a similar form of interactivity with places of interest.

<sup>9</sup> Digital artefacts by this stage are no longer proxy for cultural representations and instead become an expansive collective of human and nonhuman thick-things.

<sup>10</sup> Professional experiences stem from a variety of development and managerial roles.

<sup>11</sup> A 'how-to' guideline in chapter five will aid researchers to adapt this approach to their projects.

in automagic. Technologists and users can be willingly mystified by the power of the technologies they are using and automagic is a useful concept for suggesting this. Automagic refers to the complex technical processes hidden from view and usage of the term includes connotations of specialness and an impossible process (Raymond 2003). The relevance of automagic to this project is best established in relation to: the complexity of technologies; the novelty or specialness of the Augmented Reality use-case; the potential mutual understandings between producers and consumers of digital artefacts and the technology practitioners they're dependent on, each of whom is not necessarily privy to the practice and complex technical processes of the other.

Automagic combines with the reckless imagination of Buendía to provide this project with a critical response: to Latour's (2005) call for us to trace and modify what is meant as 'social' and to extend Kittler's early observation of an implosion of software that provides an unrecognizable layering of linguistic extensions (Kittler 1995, p.148). Latour attends to the prefix socio- considering phenomena such as socio-technical systems as collectives of human and nonhuman actants of socially constructed matters of fact and matters of concern (Latour 1999b; Latour 2005; Latour 2009). Latour is extended (in my account) by Bennett who seeks a democratic theory that recognises nonhumans as participant-actors (Bennett 2003) and they are joined by Barad and Bryant who guide my inclusion of nonhumans in the accounts of socio-technical phenomena as an entangled and intra-relating (Barad 2007) parthood (Bryant 2011) of objects and things.

This research project begins by attempting to provide a contemporary account of technology-enabled practice and concludes with the development of an interpretive framework for opening black-boxes to access and reveal the interoperability of their componentry as objects or things. This interest in automagic and black-boxes is an interest shared by the informants to this project who are properly introduced in the methods section of this introduction. The perspective from their side of the automagic divide is typically:

I don't know, would you bother? Not sure. You'd definitely, as alluded to before, you'd look into the black-box where possible, and if they probe, open the conversation up.  
(quote 106)

The nonhuman tendencies of Latour, Bryant, Bennett and Barad have counterparts and antecedents in relation to opening up the conversation and looking into the black-box. One such antecedent is Bhaskar who attempts to demonstrate a new ontology of a de-

anthropocentric shift (Bhaskar 1986, p.4.) by arguing for a realism that can serve as a theory of *being* about objects that "endure and operate independently of human activity" (Bhaskar 1986, p.6). Bhaskar acknowledges that a factual exteriority, a realism of objects, can just as readily be misrepresented with efficacy by the institutions that grant their existence (Bhaskar 1986, p.246). Here also lies a useful intersection with Latour's attention to social constructions that are a tangle of facts and concerns (Latour 1999b; Latour 2005; Latour 2009), which Bhaskar explains as follows:

Facts then are possibilities inherent in the cognitive structures agents reproduce and transform ... [they are] paradigmatic social conditions ... [and] are real ... for which our intellectual agency is a necessary condition ... [and] they are social in as much as, though dependent upon human agency, they are irreducible to a purely individual production.  
(Bhaskar 1986, p.281)

Bhaskar is granting by de-anthropocentric shift an exteriority of objects that is a realism of things that endure and operate independently of humans but also act amid the sociologies of humans. There is an intrinsic obscurity to this realism by way of the institutions and structures of construction that Bhaskar is clear about: the *fact form* self-obscures its historically specific cognitive and non-cognitive structures and relations (Bhaskar 1986, p.283).

Bhaskar's explanation of a de-anthropocentric realism that is independent of humans but co-dependent with humans usefully suggests a tension of realism(s). This tension is by way of combined ideological enablement and obscuring *imaginaire* that interacts with an exteriority of objects to generate misrepresentations. Bhaskar's fact-form is somehow able to self-obscure into a black-box as it operates as ideological enablement or as an exterior materialism of objects. This realist tensor of a self-encapsulating black-box that Bhaskar has introduced transfers to realisms of technology-enablement that are human constructions of nonhuman objects and things (such as logic boards, software code and GPS payload data) that endure and operate independent of but also amid human relations (such as the socially agreed construal of technology-enablement as automagical). However, I neither share nor adopt Bhaskar's specification of criticality. Bhaskar takes critical aim by framing social constructions as a concern regarding misrepresentations. I will instead preserve a neutral tendency with an interest in those 'misrepresentations' as imaginative representations.

I recognise in Bhaskar a position that accommodates conflicted realisms and, as encouraged by Latour, I do not accept the conflation of conflicted realities into over-

generalised theorisations of 'social' and 'complexity' to conveniently explain tensions of imagination and exteriority between human and nonhuman. I recognise a human and nonhuman pluralism that encourages multiple worldviews within which multiple points of view may flourish. Such a stance is compatible with this project's attention to: a vast indescribability of technology-enablement; Magical Realism as an expressive trace of conflicted realism(s); a human tendency to evade explanations of cause-effect in favour of black-box encapsulation or an automagic mutual agreement. The efficacy of human and nonhuman to produce a multiplicity of realism(s) — a multiplicity of points of view amid media and technologies of technology-enabled practice — is accepted here as a complement to Bhaskar's and Latour's acknowledgement of social constructions.

A central concern for this project is to describe the indescribable. It is grappling with intangible hybrids that are challenging to describe, and that move, migrating between places and information spaces. These hybrids include: image and data; hardware and software; place and geospatialities; information spaces. Automagic is a tactic that practitioners and end-users deploy for dealing with the indescribable but it is of course not an option for this project to resort to Automagic as an explanation. So the thesis describes encounters, observations and creative media projects<sup>12</sup> which provide insights to reframe the indescribable<sup>13</sup>—that circumstance of automagic—by revealing componentry consistent with the reformulated materialism described in chapter three.

This project was originally motivated by the query: does the augmentation of reality automagically create a believable location or is it an illusion of place? I am responding to this theme posed as a question, this concern that augmentation could be illusory, by enquiring with a sense of wonder that at once epitomises Buendía's fascination and fears his reckless imagination. As such, the project pursued the following lines of exploration:

- To examine (in chapters one and two) the migration from place to information spaces: is it a frictionless form of connectivity and mobilities sustained by technology-enabled actions or are there disconnections and immobilities?
- To describe (in chapter three) an assemblage of technology-enablement: what are the interoperable components and stratified layers present in a place-oriented system of systems such as Augmented Reality?

---

<sup>12</sup> Refer to appendix 3 for an explanation of how encounters have generated the evidential basis for the faceted inspection of im/mobilities amid complicated or complex configurations of media and technology.

<sup>13</sup> Here I distinguish an ethnographic description as *not* a full description of the (still) indescribable media and technologies identified in this thesis.

- To separate via interpretive parsing the socio-technical and to examine (in chapters four and five) the human and nonhuman dimensions of technology-enablement: what is a nonhuman point of view?

The following explains this interpretive project as an enquiry-driven ethnographic project, reflexively aware of researcher membership status, and that is neither case-study nor mixed method as is consistent with the conventions of good research design (Abbott 2004; Creswell 2003; Creswell 2007; Denzin, 2010a).

### *Enquiry-driven*

This project is enquiry-driven, developing a perspective informed by the researcher's professional or personal experiences and following the lines of exploration summarised above. I recognise in contemporary forms of media the challenge of an indescribable range of technologies that each interoperate in multiple ways as a result of my professional experiences developing and managing similar types of technologies, media and user experiences. This challenge is not presented as a straightforward problem statement because to do so would be to presume a problem or to problematize in advance. Instead, the previously listed lines of exploration guide the research project. The project intention has been to *describe* the interoperable and stratified layers of media and technologies in order to develop an interpretive framework that separates the socio-technical during an examination of human and nonhuman interactions.

The framing of this overall approach is consistent with Creswell recommending central questions for ethnographic projects or case studies (Creswell 2003 p.105-107). However, there is a difference to be considered between an engagement with open boundaries and a better delimited scope suitable for case study, particularly comparative case-study analysis which this project is not. The difference is that a central question relevant to the subject of this project would be better expressed for a case-study analysis in a way that includes delimiting details of the phenomena under study.

An example of a more focused central question to delimit case-study analysis of Augmented Reality would be: to describe the human interaction with interoperable technologies such as those that occur when viewing a Panoramio information layer on the Augmented Reality browser software Layar. This question could provide a basis for single or multiple case study projects because it implicitly includes parameters of comparison between either media representations (i.e. the Panoramio photos as

information layer) or technologies (i.e. Augmented Reality or Layar App). However, the disadvantage of this format of research question and the implied unit of analysis (i.e. independent cases for comparison) is that the human agent is implicit as user and the role of developer, those co-constructors of interoperable media and technologies, is reduced. In other words, the intent of this project would be compromised in advance. Restating the question to focus on developers would in turn undermine the role of users and other agents, not the least of which are the nonhuman technological contributing parts. Expanding the focused question while retaining parameters for comparative analysis would risk overloading the question and confusing the case-study.

For these reasons the purpose of the identified research questions is to guide and shape an enquiry-driven project. From the identification of phenomena under study and the establishment of the project's enquiry-driven nature unfold the following project parameters to help us relate this project and resulting thesis to other projects and fields of scholarship.

#### *An Ethnographic Approach*

An ethnographic approach fits a project that examines a single case in detail by way of forms of participation such as encounters and observation (Abbott, 2004). The descriptive agenda of an ethnographic approach is a direct response to the 'indescribable' phenomena under study and the principles of ethnography also suitably accommodate the membership status of this researcher.<sup>14</sup>

A possible alternative to an ethnographic approach while still using similar data gathering techniques (i.e. interview or review of documentation) could have been the case study approach. That approach was rejected because it would confine the work to delimited cases as explained above. This project exceeds the tighter delineation of a case-study because of its broad enquiry-driven engagement with the diverse elements of the phenomena under study (i.e. multiple technologies and media outputs achieved by a range of human and nonhuman interactions). However, that does not preclude adopting a case study approach for a similar project<sup>15</sup> and such a method could be used in a complementary future research programme to build on the findings presented in this thesis.

---

<sup>14</sup> See further explanation in the methods section about insider status and the role of autoethnography.

<sup>15</sup> See consideration #2 from the how-to guideline in chapter five.



There are many technologies and many forms of media representations that could be included within the parameters of this project simply by including the many enablers and co-dependencies that this use-case of Augmented Reality relies on. This openness has been useful because it has allowed for the consideration of such seemingly distant concerns as astrophysics. An account relating to the domain of astrophysics is provided in section 5.1 to describe the risk of satellite collisions that could have a detrimental effect on the GPS satellite constellation, thus disabling a technology-enabler of both Augmented Reality and geotagging of photos. This example demonstrates how the research project here can be focused without bounding it as the definition of cases for a case study would. The focal point here is the use-case of viewing photo collections as a form of Augmented Reality such as occurs when viewing the Panoramio layer on the iPhone App Layar. This reframing of case study to use-case<sup>16</sup> allows for the inclusion of disparate entities that connect as part of what Latour might identify as a network or Bennett consider an assemblage. So the enquiry-driven and ethnographic approach has allowed this project to move beyond the boundaries of multiple case studies — to more fluidly interpret interoperating human and nonhuman entities within a single project.

#### *Interpretive and Neither Quantitative Nor Mixed Method*

This project attends to data but not as a quantitative study would. Data is an object of examination, as advocated by proponents of Software Studies,<sup>17</sup> and so data has been a common item for interpretation but not a source of variables for calculation and analysis. A structured encounter with technology that could have been analysed by quantitative means will be explained to further illustrate what is at stake in this distinction.

A trial carried out while in the field at the location of the Augmented in Atiu encounter was a comparison of GPS accuracy. A GPS enabled camera was used to photograph the iPhone screen and LCD screen of a Garmin eTrex GPS device simultaneously capturing the recorded geospatial positions of all three devices. These accuracy experiments could have been pursued as a quantitative study by analysing the variance between devices and expressing the results as a statistic. An interpretation could then be made about the frequency of accuracy or inaccuracy of two enabling devices of Augmented Reality: the smartphone and the camera. This form of analysis was not pursued because an analysis

---

<sup>16</sup> See consideration #1 from the how-to guideline in chapter five.

<sup>17</sup> Key reference points for this examination of data are the works of Manovich (2008) and Fuller (2008) which are explained in the literature section.

of just three devices (or even 30 if the study was scaled by a factor of ten) is at odds with this project's attempt to expose via descriptive narration the array of interoperable technologies that are globally distributed and enablers of Augmented Reality. Instead, the structured encounter provided an observation: simply that the different devices have varying levels of accuracy which usefully reminds us of something important by undermining the persuasiveness of quantified data. A precise value is not necessarily an accurate value. For this structured encounter, the precise variance could be a mere 20 metres south-west which is insignificant at the scale of a global positioning system but quite dramatic at the social scales of humans and photography.

In this project, data has instead become something of a 'text' for inspection and interpretation. I made observations and gained insights about the inaccuracy between GPS enabled devices despite their equivalent precision. I reviewed my iPhone location cache file and selected an atypical moment for closer examination when witnessing assisted GPS in section 3.2. Data is a component part or enabler of interoperability that co-constructs media representations. Data is not a variable that is calculated and expressed as a statistic. For this reason the range of methods used by this project are not constituting a 'mixed methods study' combining quantitative and qualitative approaches as Creswell describes (Creswell 2003; Creswell 2007). Instead, this project is interpretive.

The preceding summary explains how academic context, scope and project parameters were selected and have provided the basis for this thesis. The next section sets out the initial literature sources that provided impetus to the project and the following section explains methods that guided encounters and interpretation.

## Literature Sources

It would be convenient to have a single theoretical proposition that promised to coherently unify these disparate and intersecting trajectories and guide interpretations of indescribable systems of media and technologies. No singular theoretical frame was found for this thesis. Instead, a series of theoretical perspectives are drawn on.

This project initially considered automagic within a broader concern for the imagined relationship between technology, sociological conditions and space. Other sources from the literature were added during the project to explain things (section 2.2), Complexity (section 3.3) and flattened ontologies inclusive of nonhumans (section 4.1). The initial sources will be presented first in the following sub-sections. Subsequent sources acquired during the research are integrated in the cross-referenced sections of the thesis.

The sub-section Technology and Technologies signals a deepening engagement with the abstract of 'Technology'. The shifting of interest in the generalised form of *Technology* to formations of *technologies* establishes the foundation for an examination of specific technologies: internet technologies used to create a sense of place such as Augmented Reality.

Latour's intervention into the taken-for-granted concepts of mainstream sociology suggests 'social' is a framing term that shouldn't be applied with haste. The problematic area of 'socio-' explanations of technology will be briefly considered in the sub-section Sociological Conditions with a focus on Bruno Latour as a key author<sup>18</sup>.

The sub-section Technology-enabled Spaces outlines a series of theorised positions that relate technologies to media and space. Notions such as: Castells' space of flows, the mobilities of image as enabled by technologies, and popularised information spaces that have been called cyberspace and virtual reality are briefly reviewed in that sub-section. Those theoretical positions contribute to the backstory of this project.

### *Technology and Technologies*

Vinge's essay The Coming Technological Singularity has been chosen to frame this section of the literature review. Vinge (1993) describes his attitude as "rampant

---

<sup>18</sup> Latour's interest in humans and nonhumans is extended by Bennett's attentiveness to nonhumans in Encounter IV and from chapter three on.

technological optimism" and I import to this project his eerie speculation. His proposition that exponential growth in technology will change humanity is plausible without Vinge needing to predict what the rate of change may be. Vinge explains the cause of the change as the imminent creation by technology of entities with greater than human intelligence. The reason for the selection of this text as a framing device is that it conjures up visions from an imagination pre-filled by imagery of increasing technology-enablement.

Clues to a possible future are littered throughout Vinge's essay with frequent mention of: an intellectual runaway; a superhuman intelligence; a transhuman state. Here I am tempted to rewrite and pursue an alternative to Vinge's proposition: technology will change humanity causing an intellectual runaway *that is a cultural vicious loop*. This project has remained conscious of this prospect unswayed by imagined futures because they may be reckless. An exhausting cycle of production and consumption remains relevant to Augmented Reality and the schematic of figure 2 illustrates the potential for reciprocal relations that evoke Vinge's proposition rewritten as a cultural vicious loop. The migration of cultural representations between places experienced via hand-held Augmented Reality and interoperable information spaces is a continuing cycle: a mobility of media enabled by technologies.

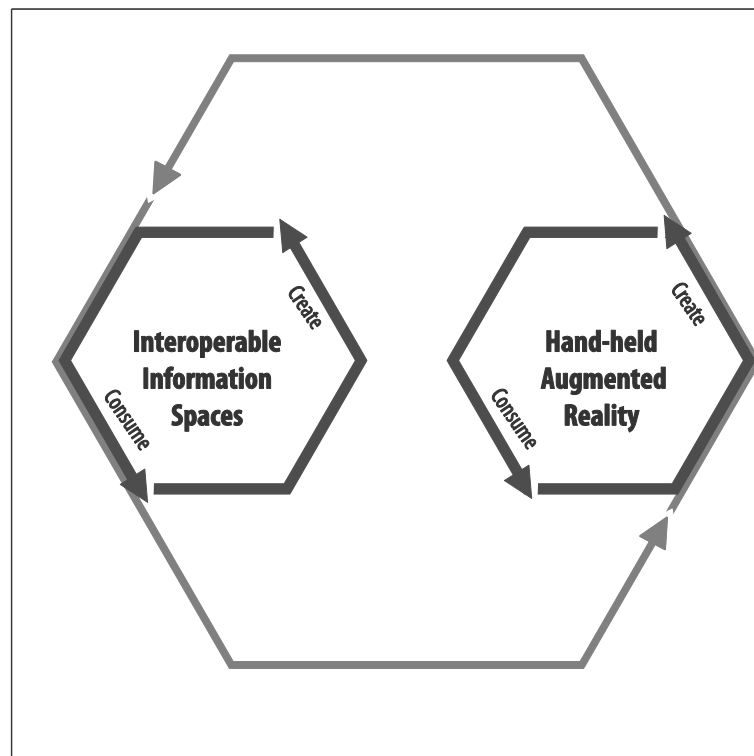


Figure 2 - Reciprocal & Migratory Relations Between Place & Information Spaces

Vinge's speculative perspective is an interesting one, not just because he is both computer scientist and science fiction writer, but because his perspective condenses into an intertwined form the issues that have arisen during the literature review of technologies. He imagines. He imagines that a future could exist from the potential antecedents emerging in contemporary science. He imagines what might be the trajectory of technology-enablement. There are two associated areas of interest that will next be teased out in support of Vinge's perspective: a cyber *imaginaire* and the technological sublime. These serve as useful bridging points to Latour's concern with what is meant as 'social' and this project's seeking of an antidote to reckless imaginations.

Flichy (2007) writes of the evolution of the internet to a cyber *imaginaire* during the 1990s. An *imaginaire* to Flichy is a collective vision shared across a multitude of roles including practitioners and users (Flichy 2007, p.4). Likewise, Nye keys into the role of imagination, writing of the unpredictable nature of technologies and the future as a consequence of cultures selecting and shaping technologies to imagine and move into the future (Nye 2006, p.210). Nye also acknowledges the tension between imagining a better future and imagining a dystopia where technologies control (Nye 2006, p.209) or surpass humanity (Nye 2006, p.224-226); the latter an echo of Vinge's proposition.

Both *imaginaire* and tension with undesirable futures are complemented by the notion of the sublime. For Mosco, the technological sublime consists of seductive myths that may or may not be feasible (Mosco 2004, p.22), a definition he reinforces by reference to Nye suggesting the sublime and imaginary have a complex and culturally-determined relationship. The *imaginaire* and sublime may prove to have useful associations with automagic for this project. The similarity between automagic and an *imaginaire* is the shared understanding between practitioners and users. The traits shared between automagic and the technological sublime are an aura of specialness and the seemingly impossible.

The intersections between automagic, *imaginaire* and technological sublime differentiate this thesis' engagement with technology from that of ubiquitous computing, or ubicomp. Dourish and Bell (2011) frame ubicomp as a myth driven envisioning of the future. Their view of myth is not as a falsehood but as an idea that drives and animates forward beyond an everyday messiness. That messiness is an acknowledgement that reality is never quite as straightforward and idealised as ubicomp

visions represent (2011, p.4). I agree with the challenging nature of contemporary technological experiences—especially compared to idealised futures that are prone to reckless imagining—but I establish that difficulty as one of indescribability and instead I attempt to open up and inspect black-boxes of automagic.

Returning to another problematic envisioning of technology, Vinge outlines a number of paths to the supposed Singularity. It is the path of intelligence amplification that is of interest to this project. Vinge identifies intelligence amplification as the 'other' path. An other by comparison with Vinge's initial focus on artificial intelligence and hardware. An other that is an easier path to superhumanity than artificial intelligence. An other that Vinge advises can be progressed by a range of possible projects. An other he suggests is unsafe and clearly Vinge's mistrust is not of the technology. Vinge's mistrust is of the human influence with its "millions of years of evolutionary baggage that makes us regard competition in a deadly light" (Vinge 1993). The human influence is a sociological basis which Vinge expects would create an entity "with a kernel based on fang and talon" (Vinge 1993). Vinge bounces the idea of amplified intelligence between most promising alternative path to superhumanity and vicious threat. Here we will instead attend to a comparatively more mundane potential instance of intelligence amplification: technology-enabled practice and the potential of a cultural vicious loop propagated by the organic growth of digital content.

Vinge's grand frame of reference remains useful as a way of evoking the *imaginaire* or collective vision that might potentially be shared between practitioners and users. Vinge's concern is with the human influence during the creation of technologies. With this concern in mind, I will shift attention to a social constructivist approach to technology studies.

The Social Construction of Technology (SCOT) is an extension of the sociology of scientific knowledge that is relevant to this thesis because it is a means to pursue a sociology of technology (Bijker, Hughes, & Pinch 1987, p.1). SCOT is a reactionary move away from: inventor centric explanations; technical determinism; marked distinctions between technical, social, economic and political (Bijker et al 1987, p.3). A common theme is the blurring of boundaries between science and technology, for instance, with the examination of whether technology stems from basic science or the move towards a seamless web of society and technology (Bijker et al 1987, p.3). The association between technology and science is of a lesser interest to this project than the progressive

interconnections between society and technologies. Any suggestion of a predominant association between science and technology is an uneasy position to maintain when reconsidered from the contemporary technological reference point of a common computing platform that is deployed in laboratories as well as bedrooms. Computing platforms, such as desktop computers and mobile smartphone devices, are dispersed from their place of manufacture into the many hands of everyday people that create and consume user generated content. Those contemporary hand-held technologies need never have any association with science.

Another relevant proponent of a sociology of technology is Sassen who views digital networks—with their decentralised access, simultaneity and interconnectivity—as embedded in hardware, software, societal structures and power dynamics (Sassen 2002, p.366). Bijker (1993) develops a technological frame as counterargument to the criticism of constructivism's excessive interpretive flexibility. Bijker's frame is adopted by Klein and Kleinman (2002) who similarly to Sassen apply structural concepts to illustrate how power assumptions shape the social construction of technology. Vinge is equally mindful that technology is embedded in societal structures and power dynamics. He dramatically presented a threatening image of technology with fang and talon as a result of a human history of power asymmetries. Vinge presents a dramatic image of power. A destructive image of human power enabled by technology is easily conjured. Instead, I will attempt to preserve a neutrality that resists asserting an inevitable dystopia or an alternative utopia. Instead, amid all these technologies and the conditions of their physical, immaterial and imagined construction, I suggest a possible powerlessness: a beyond humanness.

Bijker, Hughes & Pinch adopt a social definition of technology as three layers of: physical objects, activities or process, and know-how (Bijker et al. 1987, p.4). They claim it isn't beneficial to subdivide the concept of technology any further and instead technologies are best illustrated by paradigmatic case studies (Bijker et al. 1987, p.4) but this I disagree with. The technologies of this project are too complicated and interoperable to generalise as 'Technology' or to distinguish by comparative analysis of case study descriptions. There are too many distributed parts that are required to provide an interoperable technology like Augmented Reality. Instead a more expansive approach is required for the focused consideration of multiple technologies. Augmented Reality is dependent on multiple technologies and this collective of technologies is what Firesmith (2010) considers a system of systems.

The concept of system of systems combines a model of system qualities (i.e. capacity, interoperability and reliability) with information describing organisations, system stakeholders and types of projects to define a system of systems as a large, dynamically evolving, complex arrangement of systems demonstrating unexpected emergent behaviour (Firesmith 2010, p.12). The system of systems concept has been adopted to enable examination of technologies that are a part of other technologies or co-dependent with social dimensions. What the concept of system of systems offers this project is a shift from the generalised form of 'Technology' to a plurality of 'technologies' that is inclusive of their social construction and open to their extremely large and small scales. An interoperable system of systems like Augmented Reality is large in that it is globally distributed and small in that it depends on attributes such as geospatial data embedded in an image file.

The specialised area of Software Studies is another promising complement to SCOT and a system of systems model to help develop a critical means of engaging with the immaterial technologies of software. The work of Fuller and Manovich will be briefly reviewed to identify how the emerging area of Software Studies extends this examination of an interoperable system of systems.

This project aligns with several tenets derived from Manovich (2008). One recommendation by Manovich is to examine the assumptions and concepts of software and software developers. This project considers hardware, software, datum and other agencies ranging from technology practitioners who have held roles as software developers to organisations that watch over satellite constellations to protect them from space debris. Software Studies is being deployed here as a complementary approach within a broader critical engagement with technology (supported by SCOT and a system of systems approach) to better incorporate the diversity of these social and technical agencies. This project also recognises, as Manovich does, that a focus on software is helped if one practices what one writes about (Manovich 2008, p.8). This second tenet foreshadows the role of practice-led methods described by Biggs and Buchler (2008), which is explained later in the methods section along with an explanation of the contribution technology practitioners make to this project as informants.

Fuller (2003) by comparison aspires to theorisations that are of the particular and can operate at the level of protocol, release-version, algorithm, and programming interface; to focus on the unfolding of particulars and how they are tangled in a network of layers,



classes, patches and digital abundance—a perspective that echoes the seamless web of SCOT and the plurality of a system of systems model. Fuller (2008) later advances the notion of the particular with an edited volume that serves as a lexicon including chapters on technical specificity, such as: examination of the interactivity, control, and symbolic manipulation of a button that encapsulates codes and values from programming, commerce and ideology (Pold 2008); or the chapter that situates the dichotomy of file reproduction and aesthetic synthesis by computers within a cultural history of mechanical imitation and reproduction (Parikka 2008).

Manovich and Fuller both expound a similar agenda to SCOT but one that is grounded in a lower level of detail. Fuller's variation of software studies demonstrates that the often obscure level of constituent technologies within a larger system of systems is potentially a meaningful unit of analysis and one that, when combined with SCOT and a system of systems model, can be reinterpreted in a sociological frame. This level of complexity and particularity is a vital aspect of this project because discrete constructs that encapsulate specialness have been identified and the seemingly impossible processes of automagic examined.

### *Sociological Conditions*

Latour describes a default position in sociology that assumes social context as a specific domain of reality to account for residual aspects that other domains such as law, psychology and economics cannot deal with (Latour 2005, p.3-4). He contrasts this position with his own:

You begin to take what has been connected together for a special type of fabric: the social explains the social. You have entered a world that is no longer traceable, a world that is in danger of being quickly invaded by the fairies, dragons, heroes, and witches of critical sociology.  
(Latour 2005, p.160)

Latour draws attention to the technique of prefixing constructs with 'socio-' to invoke a context with an assumed level of explanatory power for dealing with the socially indescribable. He is attempting to disentangle sociology from other domains such as the 'socio-technical', which he suggests is a by-product from the field of SCOT (Latour 1999b, p.198-199). Latour's intention is to trace the associations of human and nonhuman actants. He offers Actor Network Theory (ANT) as a method for accessing specific sites (Latour 1999a, p.20) and his examination of the meaning of technical mediation provides a useful example of how a framework could guide analysis in order to untangle the socio from the technical. Latour's analysis uses ANT to fold humans and nonhumans

into collectives where he examines the mediating role of techniques by reversible blackboxing using as an example the case of a dysfunctional overhead projector (Latour 1999b, p183-185). Latour attempts to isolate state changes as an object undergoes crisis and transforms from a single item to a collective of parts and people. Similarly, this project examines Augmented Reality by inspecting collectives of human and nonhuman things to determine the mediating or transformative role technological parts and people play.

Actor Network Theory (ANT) demonstrates how to composite technical and human actors into a model of 'relationality' applied to all entities (Law 1999, p.4) be they human or nonhuman in a way that might aggregate their interactions into a local and practical locus (Latour 1999a, p.15). The relations are transformative and not transportive like a network (Latour 1999a, p.15), acknowledging that the entities achieve their form through the performance in, by and through those transformational relations (Law 1999, p.4). Similarly, this thesis will inspect the interoperating technologies and practices of Augmented Reality just as Latour attempts by reversible blackboxing and as Software Studies encourages. In this project a series of encounters will descend inside the black-box to inspect the geospatial data of a photo collection in section 1.2 and to witness assisted GPS in section 3.2, to anticipate just two encounters presented later in this thesis.

The structuring terminology of network and assemblage are the vocabulary of Latour (1999; 2011) and Bennett (2005; 2010b) but those terms may not extend to the indescribability of Augmented Reality and so the interpretive framework developed in this thesis will also test those terms. There is a relevant alternative to Latour's treatment of a network of actants as a collective and it deserves brief consideration. Theorisations of assemblages are an alternative approach to provide an account of material and expressive elements of technologies or the roles of technologies as stabilising or destabilising (DeLanda 2006, p. 12). Elements gathered during this project could for example be conveniently explained as social assemblages of reasons and motives in a territorialised constellation of social networks, institutions and actions (DeLanda 2006, p. 34; Slack & Wise 2005, p.130). However, to explain the indescribable as either assemblage or network is as convenient as explaining the indescribable as socio-technical or cultural or automagical. The thesis instead extends the terminology of Latour (and later Bennett) with an alternate vocabulary determined from encounters with those informant gypsies that can be used to describe the indescribable systems of systems that enable Augmented Reality.

Latour grapples with the conflation of human and nonhuman entities and their material and social traits, much as I expected to in this project. His work furnishes a particular sense of initial purpose to the expected grappling; the decoupling of socio from compound forms of sociotechnical systems. Likewise, I also grapple with the structural terminology of 'network' or 'assemblage' and will remain open to alternatives that suitably describe and explain the indescribability on which this project focuses.

### *Technology-enabled Spaces*

This project examines how people encounter a sense of place using the technologies that enable Augmented Reality. The engagement with a technology-enabled notion of place for this project is different to other evocations of information spaces such as cyberspace or virtual reality.

This project will instead model human and nonhuman actants considering actions and associations between geographical space and information: the technology-enabled interoperability of place and information spaces. The digital media and technology-enabled practice of place and information spaces will be framed in chapter two by the work of Castells. His three layered description of a space of flows (Castells 2000a, p442-445) presents an opportunity to invert and rework older space and time theorisations in a contemporary frame that accounts for the multiplicity of media, technologies and spatial interactions made possible by smartphones.

An analysis of the space-time capability constraint could consider what gains are made by people with access to information to obtain knowledge of other space-times. The examination of user generated content will consider this line of enquiry reviewing the technology-enabled creation of a photo collection (in section 1.2) and consumption via Augmented Reality (in section 1.3) similar to how Kwan considers the positive benefits of 'generation' where the greater availability of information increases participation such as travel (Kwan 2002, p.477).

Shifting attention to the space-time coupling constraint, an analysis of technology-enabled practice could examine how mobile technologies and time-coded digital content could enhance territorialisation if the creative technologies were synchronised to a global time. There is a potential immediacy to the cyclic process (see figure 2) that creates and consumes imagery that is enabled by a combination of Augmented Reality and user generated content. Such an immediacy could possibly reverse issues such as

those Schwanen & Kwan describe regarding deterritorialisation by corporeal presence and movement in physical space that is brought about by information and communication technologies (Schwanen & Kwan 2008, p.1364). The encounters with an informational view of Atiu in section 1.2 examine the mobilities, immobilities and territorialisation that occurs via a photo collection embedded with geospatial data.

Mobility is movement invested with meaning; a movement that transforms the spaces where it occurs (Adey 2010). Mobilities can be synchronised and move in relation to other mobilities; they can be an assemblage of technologies, images and practice that operate in unison to reproduce themselves; travel and mobility can be conceptualised as flows and circulations (Adey 2010, p.26; Urry 2002b, p.144; Peters 2006, p.3). Of specific interest is how the inherent dynamic of mobility offers a contrasting perspective to the static digital artefacts of this project: a collection of photos. Those photo collections are presented as Panoramio layers in Layar. The imagery becomes a still image infused with movement by methods of interoperability when the Augmented Reality software retrieves the geotagged images embedded with data such as geographic coordinates. The place-specific photos are selecting from albums and automatically presented together with geotagged photos from other Panoramio users. The photos are re-circulated by interoperable technologies and synchronised with the photos from other people who visited the same location.

Cyberspace and virtual reality are two technology-enabled concepts of informational spaces to consider in contrast to geographical places. Cyberspace is the closest approximation to the information spaces of this project. However, even that is a name coined in fiction to represent the complexity of the entire universe of information and applied to networked spaces and interactive delivery of information via the internet (Woolley 1993, p.122). Both cyberspace and virtual reality are used generally and confused as pseudo spatial names. These are key terms in a vocabulary struggling to describe the indescribable through metaphors transferred from the material world to the dematerialised to label new experiences as they were discovered (Woolley 1993; Adams & Warf 1997; Adams 1997; Taylor 1997; Wilken 2007). This well-worn examination of metaphoric labelling and definition of cyberspace will be set aside as will virtual reality. A way of describing the combined material and immaterial technology-enablement of place and information spaces (with a focus on an Augmented Reality use-case) will be pursued instead of the alternative metaphorical naming of separate immaterial spaces.

The preceding section has outlined literature sources that frame technology as a close but difficult to understand associate of sociologies. This project finds encouragement from Latour's rally against explanations as merely 'social' while recognising that technologies are subject to social constructions as occurs with *imaginaires* and automagic. Relevant spatial and structural terms such as networks, assemblages, cyberspace and virtual reality have been acknowledged. The inherent processual nature of cycles that create and consume digital media has been set against time-oriented flows and mobilities of people and media. The following section explains methods for encountering and engaging with socially constructed technologies and flows of geospatial media as primary sources for this project.

## Methods

This project adopts an ethnographic stance to encounter technology-enabled practices that are a combination of human and nonhuman agencies but with a view to theory-building. This section explains this methodological stance and the choice of methods relevant to the encounters and sources of this project.

This methods section also establishes the basis of research activities as something more than a 'project' that followed research design. The project began and continued to operate within the parameters of its initial design but the project became something more, perhaps equivalent to a series of life events because interactions between people, technologies and media spanned multiple years. The notion that a method or research generally has a biography (Pink & Leder Mackley 2012; Pink 2013) acknowledges the developmental nature of a research project<sup>19</sup> and frames this methods section as something more than an explanation of 'activities planned and undertaken'.

The notion of biography applied to a research project is not suggesting this project is biographical or an autoethnography.<sup>20</sup> Instead, the first part of this methods section connects established ethnographic methods and techniques to encounters and chapters of the thesis. One example of such a connection is the process by which the visual methods of this project have developed. The visual diaries of Latham (2004) are connected to the photo collection from Atiu (from chapter one) via a previous project that plotted the timestamp data from each image (Nicholson 2010; Fleming & Nicholson 2013). The result in chapter one is distinct from Latham's visual method but the connection between those methods is a biographical thread relevant to the technologies and media of this project — that of digital photography with embedded geospatial data — and no reflection of the biography of the researcher.

A biographical dimension of researcher and method does intermingle in the second part of this methods section that introduces industry informants. An extended focus on an ethnographic concern with role boundaries and membership justifies the designation of participants only as informants because the technique of interview method is a limited form of encounter when compared to the lengthy verbal exchanges that occur between practitioners developing the media and technologies of this study. As Pink & Leder

---

<sup>19</sup> I further the notion of a research project's biography with Denzin's recognition "that all methods are hybrids, emergent, interactive productions" (Denzin 2010a, p.423).

<sup>20</sup> The contribution of autoethnography is explained later as a method that reminded of role boundaries and membership during the conduct and textualisation of this ethnographic project.

Mackley recommend, there is "a corresponding need to comprehend the implications of the biographies of methods ... for the qualities of research knowledge that they can potentially produce" (Pink & Leder Mackley 2012). As researcher with personal experience of the verbal exchanges that occur between practitioners who develop or manage the enabling technologies of this thesis, I was able to recognise the importance of designating the input of practitioners as informants and the value of textual analysis to interrogate how they spoke of technologies.

The final part of this extended methods section explains the transformation from encounters and sources to thesis as an approach to textualisation that surpasses mere written descriptions of technology. Something more than inscription of participant observation is provided by the thesis. Denzin's manifesto for critical interactions between researcher and sources (Denzin 2010a; Denzin 2010b) is an impetus that supports the layering of texts within the periodisation of Macondo, McOndo and m.com/do<sup>21</sup> to establish a narrative of progress implicated in the asynchronous base architecture of internet technologies.

#### *Ethnographic Methods and Techniques*

Marcus & Fischer (1986), Hammersley & Atkinson (2007), Clifford (1997) and others inform the classification of this project's research design as interpretive and focusing on social meaning not objective measures of a natural or social reality. The project approach has adopted ethnographic methods and techniques to encounter, gather and use material and immaterial evidence of media and technologies. The social realism pursued by this project is that of technology-enabled practice and so this is not *an Ethnography* because analytical engagement is with distributed technologies and media. As such, it is not an Ethnography that engages with a particular collective of people despite the presence of humans assuming a variety of roles that create media, develop or simply use technologies. Instead, this project operates under the rubric of ethnography by adopting ethnographic methods and techniques.<sup>22</sup>

Ethnographic principles provide guidance for research encounters drawn from social experiences. A number of ethnographic principles have been considered (Hammersley & Atkinson 2007, p.3; Hammersley & Atkinson 2007, p.15; Marcus & Fischer 1986, p.26-27;

---

<sup>21</sup> The places and characters of Macondo, McOndo and m.com/do are introduced in the prologue and m.com/do is developed further as a digital ethnographic place in section 2.3 (after Pink 2009 & 2013).

<sup>22</sup> This alignment to established methodological discourse demonstrates consideration #2 from the how-to guideline in chapter 5.

Atkinson 1990, p.36-38) from which two key principles are adopted. First, sources and interactions have been read for their meaning by a researcher conscious of the importance of reflexivity to acknowledge constraints on autonomy and the potential presence of the researcher in the phenomena of this study. This principle recognises that any encounter with technologies and media requires interactions as a user and consumer of those technologies and media. The second principle requires critical reflecting on the nature of the ethnographic project as an interpretive act of observer and participant that constructs or are constructed into a rhetorical output. This second principle acknowledges this thesis as a researcher text that is an output from research project encounters and interpretive engagement with sources. This second principle will be examined further with input from Denzin later in this extended methods section.

Additional research methods that offer support for a specialised examination of technology-enabled practice are visual anthropology and virtual ethnography. Pink (2007) and Latham (2004) explain techniques for integrating visual experiences and material, of both participants and researcher, within analytical and interpretative methods of research projects. Hine's Virtual Ethnography (2000) is another specialised anthropological subsidiary that has informed this project's interest in technologies and peoples (the multiple roles of creator, producer, user or developer of media and technologies) that construct online representations of place using internet technologies. The encounters later in the thesis with an Atiu photo collection, a Panoramio user's photo album and a Google Street View outside of Sam's Bagels are examples of the contribution of these visual and virtual methods. The gathering and using of these sources was also guided by Law's method assemblage to gather things into researcher determined arrangements (Law 2004, p.143).

Ethnography requires the clear consideration of self and insider status. For this researcher, I also self-identify as a member of the nominal social group: technology practitioner. My dual role as practitioner and researcher is consciously declared and evaluated. The boundaries of membership and the tangled relationships of dual roles are usefully foregrounded by autoethnography providing a methodological stance for the reflexivity encouraged by the ethnographic principles explained earlier. Autoethnography is another qualitative method befitting an interpretive project and the insider status of this researcher. The complementary modes of analytic and evocative autoethnography (Anderson 2006; Denzin 2006; Ellis & Bochner 2006; Atkinson 2006) have guided this researcher while: piloting procedures that are expected of participants;



conducting self-assessments of technology usage; examining the potentially overlapping interests of self and participants; representing interpretive outcomes in a rhetorical output.

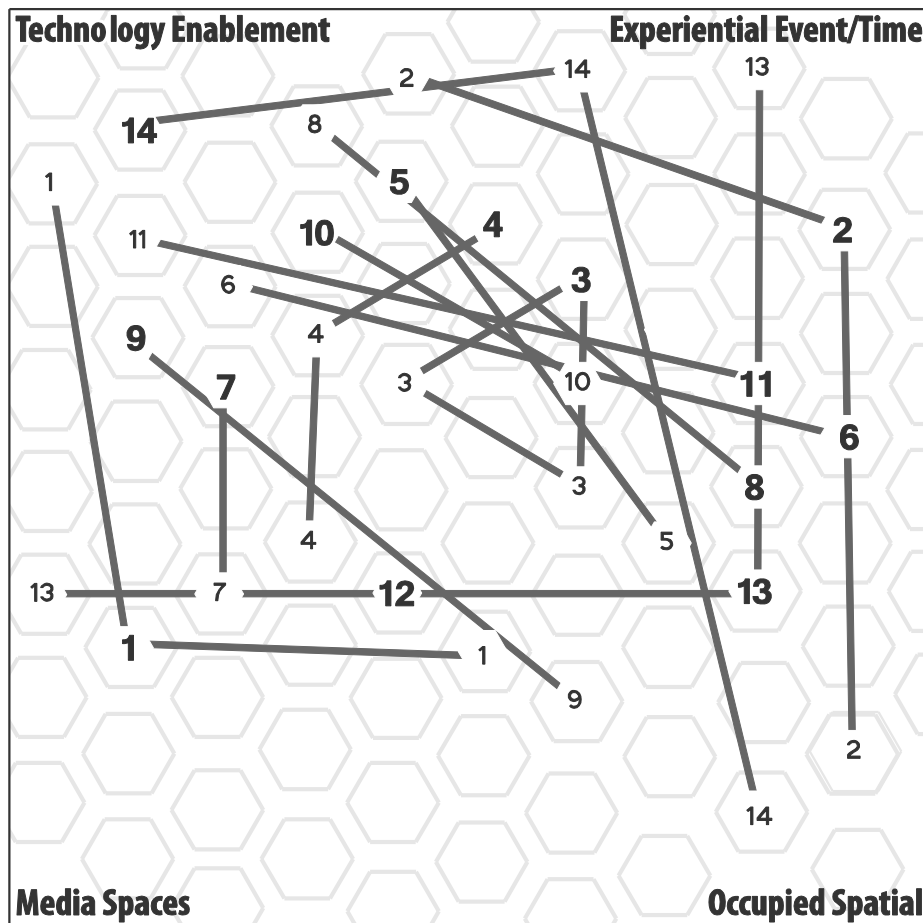


Figure 3 - An Emergent Network of Associations

Another dimension to an ethnography is the field-site where social encounters occur. The location of a particular site is not easily identified when technologies, photo imagery and spatial relations are involved. Spatial and temporal constraints are relevant to this project because Augmented Reality is dependent on the interplay between technical things in spatial relations to create a sense of place via information spaces. However, the locations of Augmented Reality encounters are distributed between geospatial places and information spaces. There is no specific location nor comparative multi-site locating of this project which is unusual for an ethnography but the distributed locations are typical of contemporary media technologies. The distributed locations of fourteen

sources<sup>23</sup> that are enablers of Augmented Reality are mapped out in figure 3.<sup>24</sup> The encounters of this project with these sources are located at places, in online web spaces, and more obscure locations such as a data file retrieved from a device or extracted from a photo. The encounters are a mixture of technology enablers, media, spatial practice or experienced event and not observations at a cultural site that has an accompanying geographical location.

Clifford's reconsideration of what constitutes the field-site and his assertion that the field-site is not a geographical space but is a set of discursive practices (Clifford 1997, p.21-22) will instead provide an alternative notion of field-site for this project. Clifford is concerned with the confusing of culture and spatialities as people of places are deemed village subjects and an analytical unit for ethnographies. Instead of locating a field-site geographically, Clifford opens up the spatial restriction by asking "how is this place of work bounded in space and time?" (Clifford 1997, p.21).

Clifford's concern for the narrow focus on field as a concrete place inhabited by cultural subjects has opened up the conception of a field-site from local to global and in doing so enables the reconsideration of the field-site for this ethnographic approach as including globally distributed informational spaces. Clifford does so by outlining a broader sense of discursivity than local linguistic practices and explains discursivity as a communicative competence which he posits on language without reliance on localised and concrete locations (Clifford 1997, p.22). Later in section 2.1 I will look to Appadurai and his notion of *Scapes* (Appadurai 1990; Appadurai 1996) to extend Clifford's discursivity with a theoretical model relevant to the dimensions of media, information, social imagination and the technologies of this project. Appadurai's discursivity is considered in section 2.1 alongside Castells' globalised and network conceptions of media and technology.

The previous explanations of visual and virtual methods have framed the ethnographic approach of this project. The ethnographic approach of this project is a versatile configuration to accommodate: practitioner accounts, visual anthropology of digital artefacts, virtual ethnography of information spaces and practice, descriptions of technologies and descriptions of technology-enabled practice. These approaches convert to the research encounters of this project. The following outlines the types of

---

<sup>23</sup> See appendix 3.3 for the list of sources and initial mapping of those sources to the locations presented in figure 3 and again in appendices 3.3 to 3.5.

<sup>24</sup> Appendix 3.4 further explains the locating of encounters between places and information spaces.

encounter that have generated the ethnographic data sources for analysis and interpretation:

1. Semi-structured interviews with industry informants. Interviews were structured around a conversational mode of question delivery to encourage discussion of complex and potentially indescribable technologies. Interview technique was combined with other interview formats, such as the discussion of technology architecture diagrams explained in appendix 2.2.
2. Records and documentation were reverse engineered to seek explanations that situate descriptive accounts within a wider architecture of technologies and human behaviour. The review of Apple Inc.'s privacy policy and location based services (Sewell 2010) is an example of this in section 3.2.
3. Encounters occurred at specific sites to observe technology usage in different spaces, such as the encounter Augmented in Atiu from section 1.3.
4. User generated content and data-sets were generated during the encounters, such as GPS data and photographic collections. These sources of data were combined into a visualisation to support place-oriented analysis, such as the encounter An Informational View of Atiu in section 1.2.

Having explained the approach and types of encounters of this project a limitation should also be acknowledged. There were particular conditions that determined the scope and type of encounters of this project, such as the routes travelled, sites and scenes visited and material or immaterial evidence of technologies that were gathered and used. Those conditions usefully reinforce the 'contemporary' intention and contingent qualities of technology-enabled practice but also hinder any subsequent ability to replicate this study. One example of a specific condition that would be difficult to replicate is the unplanned opportunity that arose which is commonly referred to as the iPhone SpyPhone incident (Boing Boing 2011).

The iPhone SpyPhone incident arose from exercises in mobile security and iPhone forensics (Neal 2011; Warden & Allan 2011) which then gained worldwide notoriety<sup>25</sup> as concerns escalated<sup>26</sup> about the iPhone's (and other smartphone brands<sup>27</sup>) capability to track and report on an individual's location with the imagined accuracy of GPS. This was

---

<sup>25</sup> A media storm erupted as technology media such as Slashdot followed the incident (Slashdot 2011c).

<sup>26</sup> Evidence of the escalating concern is the class action suit (Kamber & Stampley 2013) which reappears in the tear-down in section 4.3 and another lawsuit Google faced (Foresman 2011b).

<sup>27</sup> See (Foresman 2011a). The relevance of this observation is that it reveals industry practice as opposed to a single company's actions.

an emergent event that could not have been planned as part of any research design. Also, this analysis can no longer be easily replicated if your iOS device was upgraded past iOS version 4.3.3<sup>28</sup> which was released 04 May 2011.

This unplanned event was a relevant opportunity that could not be foreseen and so it did not feature in the initial research design for this project. This event shifted my line of sight in a way befitting the Software Studies advocated by Manovich and Fuller and the descent into 'non-socio' detail called for by Latour. This incident introduced a very low-level of datum that is machine generated. The line of enquiry already being followed by this project remained the same but my perspective — my researcher 'sightline' — was altered because of this opportune access to a contemporary source. The iPhone SpyPhone incident was an encounter that provided: a behind the user interface point of view of interoperable systems; a class action lawsuit fuelled by a surveillance imaginaire; data that located myself together with technology in a particular time and space.

To recap; virtual ethnography (Hine 2000) endorses the examination of user generated content in situ within internet systems. Researcher driven interpretative engagement borrowed principles from Latour (2005) to describe a networked assemblage of what Firesmith (2010) would potentially refer to as a system of systems for Augmented Reality browser software. What Latour (2005) suggests is a problematic association of social arrangements is examined in the assemblage to identify the influence of technical and non-technical attributes. Global perspectives on human-geography (Harvey 1990; Castells 2000a; Schwanen & Kwan 2008; Kwan 2002) provide an association between theorisations of space, time and technology-enabled practice with time-stamped digital photos that are the media items from user generated content collections created while on-location visiting destinations. As Castells suggests, “hypertext constitutes the backbone of a new culture ... in which virtuality becomes a fundamental component of our symbolic environment” (Castells 2000b, p.694). This project is an examination of the cyclic technology-enabled practice of producers and consumers who use internet technologies while moving between places and information spaces.

Visual anthropology accommodates a variety of engagements between participants, their texts, and researcher. Pink (2007) differentiates between the use of: researcher images, participant images, and images used as an instrument such as an interview prompt. Three examples of a reliance on visual anthropology for this project are:

---

<sup>28</sup> The 4.3.3 iOS patch was a response to the media storm. The response was to encrypt the location data.

researcher site surveys during Augmented Reality encounters on Atiu; user generated content being a collection of participant images; technology architecture diagrams being a single participant image that is used as a prompt for interviews. Researcher images generated during the self-assessment of technology (such as the testing of GPS equipment) is another combination between visual anthropology, the emphasis on practice of Biggs and Buchler (2008) and the mixed membership of an autoethnography.

Industry informants have also enabled the thesis to interpretively transcend mere descriptions of technology—to delve beyond the user interface and descend into the rift—and reach interpretations of contemporary technology-enabled practice. The following section continues the preceding explanations of method with a focus on the inclusion of participants as industry informants.

### *Industry Informants*

Four people were interviewed.<sup>29</sup> All informants have held multiple technical roles in the ICT sector equivalent to a practitioner that develops or manages the enabling technologies of this thesis. Through their knowledge of technologies and application of that knowledge they have been required to produce professional outcomes for their employer with a range of interoperable technologies similar to the technologies of this project. Each informant has extensive yet differing knowledge of internet and mobile technologies and varied knowledge of Augmented Reality. Having already been aware of the potentially obvious finding, that technology is complicated, I initiated these interviews to explore these practitioners' perspectives, asking them simply: what does technology mean to them?

They responded that Technology is advanced, new and complicated. They inflected their vocabulary into the developing interpretive framework explaining how they work with atomic building blocks pulling together disparate elements that hide complexity. The phrases and keywords have proven informative to this thesis yet I recognise their isolation from the prolonged toil that constructs those advanced, new and complicated technologies. The interviews were elaborate discussion but a key difference of this method and a conventional ethnography relying on participant observation is that the interviewed people informed the development of a vocabulary and did not demonstrate

---

<sup>29</sup> Refer to appendix 2.0 for an overview of interviews and their analysis; appendices 2.1 and 2.2 for interview protocols; appendices 2.3 and 2.4 for raw quotations and phrases; appendices 2.5 to 2.7 for the abstraction from discussion to analytical categories in support of thesis propositions.

or support researcher observation of or participation in what they spoke about. Their toil is often introverted as either problem solving within a practitioners mind or combined in operation with the internal workings of the specialised fields of computing. The interviews were long and extended but our contact was short when compared to my professional experiences of technology development. Hours of interview material does not substitute for months or years of industry time spent developing and maintaining technologies.<sup>30</sup> For these reasons the interviewed people are identified as informants to this project and not participants. This group of informants is characterised as the contemporary gypsy descendants of Macondo throughout the thesis.

Questions and responses did not explain technical activities in similar detail to what I am used to from my professional experiences. Time is the reason for this. Research encounters occur within a matter of hours whereas the construction of these technologies is distributed over overlapping project timeframes lasting months or years and the personal schedules of many. The limitation of time prevented the detailed explanations of how technologies work or are not working that I am familiar with from professional settings. Instead, the informant interviews provided a different dialogue about the detail of technologies. Informants provided atypical explanations of the complex or complicated formation of Technology with reference to interoperating technologies and without the typical and mundane explanations of how technologies are used or developed.

The dialogue between researcher and informants required an approach to textual analysis. Informants would seek the right things to say and then elaborate by outlining additional complementary parts. The elaborate responses with their varied and detailed content resembled verbal structures where the informants were establishing through their exposition a precise reference with supporting statements as complementary components. Coding and analysis of the interview transcripts<sup>31</sup> attempted to unravel this, to unpack the components, separating out key concepts and their parts from informant responses within the interview transcript. Statements were isolated as raw

---

<sup>30</sup> This limitation is explained later in this section with an explanation of this comparison to professional practice of informants.

<sup>31</sup> Initial, In vivo, Simultaneous, and Theoretical qualitative coding techniques (Saldaña 2009) were applied to interview material. See appendix 2 for protocols, coded interview material, analytical memos, and specifically appendix 2.6 for an explanation of the stages of coding and translation into analytical memos.

quotes,<sup>32</sup> then the quote was further separated into the isolated parts as phrases<sup>33</sup> and finally secondary coded with the informant's language.<sup>34</sup> This analytical version of their vocabulary was elaborated with researcher memos.<sup>35</sup> The first insight substantiated proposition one: specificity. Simultaneous coding revealed the interchangeability<sup>36</sup> of the terms complication and complexity as demonstrated by practitioners and this has been modelled in a network diagram to stratify<sup>37</sup> separations and overlaps between complication and complexity. From this analysis of complication and complexity another insight was suggested and that has been theoretically expanded in section 3.3 as proposition two.

There are 350 phrases isolated by invivo coding from the interview material and raw quotes. Two phrases have been selected to briefly demonstrate the insights offered by practitioners. Two phrases by informants were that Technology can be "advanced constructs" (IV31)<sup>38</sup> and "particularly specific" (IV205). These two phrases are presented as competing alternatives. A suggested difference between these two responses is that "particularly specific" suggests a narrow and granular composition whereas "advanced constructs" suggests a synthetic compound entity with implicit reference to the making or human construction of technology-enablement.

Purpose is an expectation of technology shared by informants. Technology is "to do something to suit some role" (quote 1) and is used "to perform certain functions that you know the technology may be applicable to" (quote 13). There are two aspects to each of these clauses: intention and application. Intention is "to do something" and "to perform certain functions". Expectation of application is suggested by the statement "to suit some role". Now an alternative voice begins to emerge as the vocabulary and concerns of these informants start to influence the textualisation of interpretations. An explanation of Technology synthesizing these responses is: a synthetic compound entity of a granular and specific construction that serves intention and application.

The initial responses by informants were followed by an explanation of technology relative to time. The relevance of time was not raised by the researcher. After initially

---

<sup>32</sup> See the raw quotations in appendix 2.3.

<sup>33</sup> See appendix 2.4.

<sup>34</sup> See the emic categorisation in appendix 2.5.

<sup>35</sup> See appendix 2.6 for 'advanced constructs' and 'complicated or complex'.

<sup>36</sup> See appendix 2.7.

<sup>37</sup> See appendix 2.7 figure 38.

<sup>38</sup> This notation identifies invivo quote 31 from appendix 2.4.

explaining technology as an advanced construct, an informant went on to identify technology as "probably new" and that it stops being technology because it is "established" and becomes "ubiquitous". Another informant shifted from an explanation of technology as prescribed facility to a historicised consideration of the evolving relationship between technology and its use by humans explaining that "technology is something that we've had since we were cave man and it evolves with us ... as our needs and expectations evolve" (quote 16). These responses suggest that technology is more than a contemporary entity or artefact. Technology is also a historicised entity with a relation to humans that may evolve even while its properties stay constant. This association between time and technology deserves further inspection and those insights will be examined next.

An informant's identification of technology as 'new' was acknowledging his observation that "the idea of technology [is that] it's the new stuff that solves problems" (quote 7). That informant believes "there's technology there, but people don't perceive it as technology" (quote 6). That informant recognises the presence of prerequisites conditioning what Flichy (2007) would refer to as an *imaginaire* or that I consider to be prerequisites for automagical thinking and reckless imaginations. The informant also identifies a threshold that when technology ceases to be technology despite retaining the same properties of construction and application:

After a while it stops being technology ... it's just a building block ... if it becomes so ubiquitous it's part of your life, it's no longer technology.

(quotes 1-5)

The evolving status of an entity as technology suggested by the informant is not simply a reflection on the appeal of new entities to people and the subsequent passing of time. Attaining ubiquity is not a pre-ordained destiny of anything technological. What is understated by the informant is the factors that enable a technology to be extensively diffused to the point where it becomes an everyday occurrence in the lives of many. The generalisations of "part of your life" deserves further examination to better establish the presence of building blocks and their mediating influence.<sup>39</sup> There are possible intersections here with the diffusion and perception of technology. Rogers' (2003) diffusion of innovation and Flichy's (2007) *imaginaire* warrant a brief reconsideration as a result of the informant's perspective. The informant's contribution suggests that

---

<sup>39</sup> Chapter three takes up this interest with an examination of invisible infrastructure.



diffusion and *imaginaire* are potentially conflicted, with *imaginaire* negating the status of technologies as a 'Technology' once thresholds of diffusion have been reached. This brief challenge to the diffusion of technology reminds of the importance of unravelling social forces from technologies just as Latour calls for.

Now to return to the final difference between these informant interviews and the construction of technology in a professional context. The final difference is a simple one. It is also one that challenges methodological motives. Motivations that were first influenced by the challenge of a participant-observation method of ethnography for technology investigation where the observable is mundane and the practice largely cognitive, in other words, rendered invisible by the fog of every day computing practices and the subjectivities of participants. Much detail was revealed during interviews but they are inevitably limited by their natural state: they are a brief ethnographic verbal account given by informant to researcher. In addition to the contribution of these informants I need to encounter the media and technologies of this project for myself.

The following explanation continues to open the rift expanded by the informants' vocabulary and encouraged by Firesmith, Latour, Manovich and Fuller. Next, I will outline the experience and prior interpretations I brought to the interview as researcher and a peer in the industry. I contribute an industry perspective alongside these informants.

These practitioners have all confronted technology in far more detail than I have in my professional capacity and so the discussion was noticeably a researcher and informant dialogue. There were three notable differences between researcher interaction and professional context: responses were dredged up and their articulation drawn out creating accumulatively elaborated responses; the detail of responses contained unexpected range and depth of content; the interview format was a significant undertaking despite similarities to a typical workplace meeting. Now to explain how these differences compare with professional contexts.

The main indicator that responses were accumulatively elaborated was identified during transcription. The interviews were a natural conversation, with the exception that informants may have been aware that I was assuming a more passive role than they were expecting. The interviews were natural and it wasn't that responses were belaboured in any way. Transcription revealed the internal narrative structure of semi-independent phrases and clauses that constructed an exposition from a range of

perspectives mostly using plain language or some form of analogy to everyday examples such as appliances like a vacuum cleaner or specific technology such as the combustion engine. By comparison, workplace conversations about technology last for similar periods of time, often longer, and are task oriented with a focused specificity.

We talk about the technologies by name when at work; not as abstract or generalised concepts. As I write this explanation, I realise now that this is what I was told by informants when I asked "how do you use the word technology?" The interview protocol was structured around simple questions beginning at a general level and ones that would potentially generate practitioner oriented responses. However, their responses were not as practitioner to practitioner because the level of generalisation appears to have shifted their perspective. The informant interviews began as a discussion about technology, technologies and internet technologies but they became a broader dialogue about what it means to have and to create technologies.

The informants' responses contained a range and depth of content not typically covered in a workplace conversation between practitioners. For instance, one informant's response gave a sophisticated 40 plus word explanation of technology as a tool, framing the explanation with terminology such as "prescribed facility" (IV11). Another informant spoke of multidisciplinary qualities when computing, electrical and refrigeration technologies are combined in air conditioning.

My experience of workplace conversations is they tend to focus on intentions and applications of technology in organisational contexts and not technology despite the extensive use of technological language. Workplace discussion about actual technology was revealed in the question that asked for role-specific approaches to explaining a web server to end-user, myself, and a system administrator. These types of workplace discussions are a hybrid of assumptions and testing of the other party. Prior knowledge of professional roles and incumbents reinforce assumptions about economical use of language and explanation. Meanwhile end-user explanation is a dialogue testing for a willingness to enter the black-box and comprehension of the dialogue through explanation by analogy.

The final difference is that much was said within an interview generating many rich insights from first-person sources. Except, this interview format is a limited frame of reference to serve as a window into the practice of technologists. The simple difference

is the limitation of time.<sup>40</sup> Practitioners spend constant amounts of time situated within personal and organisational contexts over months whereas interviews were as brief as 1-2 hours occurring in a single sitting or over an extended period of 4 weeks. The comparison is between a fractional amount of time in an alien context of researcher instigated participation and the countless hours of exposure to organisational development of technology. Or, the countless hours spent working with technology as evident in my own efforts at practice-led research<sup>41</sup> when my attention was divided between subjective cognition and the use of technologies to construct outcomes.

Simply put, this in-depth ethnographic approach is only a fraction of the full experience when compared with the intellectual effort invested by practitioners in their practice to achieve professional outcomes. Little can be observed and much has been left unsaid when compared to professional encounters. The benefit to this project of these encounters is that they provide insights beyond device and user interface that could not have been achieved without the dialogue with informants. This thesis has instead re-framed the practitioners' contribution by reinforcing their role as 'informants' to acknowledge the relative limitation of their participation. The practitioners who were invited to participate and were interviewed or contributed with technology diagrams are referred to as informants and characterised as the contemporary descendants of the Macondo gypsies.

#### *Transforming Encounters into Written Text*

This section explains the transformation of method and encounters to written text. The intention of this thesis is to *not* present a complete written description of contemporary technologies as new and fascinating. The intention of this thesis is to surpass mere written descriptions and to provide a framework for reinterpreting media and technologies.

The question which is always missing for me is, why? It's all very good and well to have some device, but why, what does it actually do for me, how does it improve people's lives in any way, these questions are simply missing and subsumed simply

---

<sup>40</sup> The limitation of this project is the quantity of time spent with practitioners and the mode of interaction with them being limited to interview and visual elicitation of technologies. This has been mitigated in the project by researcher industry knowledge and secondary sources. There is potential for future projects to reconsider the scope of this project and this balance between informants/participants, secondary sources and researcher embedded participation.

<sup>41</sup> Examples include configuration of a LAMP web server, PHP scripting, programmatic visualisation of photographic geospatial data, and the proof of concept of an Augmented Reality Geolayer.

into 'new technology, it's fascinating' ... 'new technology, this is good, because it's new' ... and I guess I think of that news cycle, that technological news cycle when I hear 'written description of technology'.

(quote 171)

Denzin's (2010) declaration of a manifesto for social transformation encourages a particular type of interaction between researcher and sources that has guided the writing of this thesis. The relevance of professional practice as an informing source was explained earlier as an intersection between researcher, professional informants and encounters based on technology-enabled practice. I recognise that access to the interfaces of informational technologies and places of this project will require the use and technical inspection of those technologies in a variety of spaces and places by this researcher. This is beyond the norm of participant-observation encounters and will require a pragmatic extension to autoethnographic method that avoids an introspective self-examination immersed in those technologies. A practice-led approach (explained later in this section) will favour descriptions of interactions as evidenced by traces of data acquired by 'gathering' sources while 'using' technologies.

The transformation of those encounters from interactions with technologies to inscribed and interpreted sources requires explanation. A transformation of those practice-led encounters is the transforming of encounters with technologies to critical interpretations. In other words, the articulation of those sometimes personal but often technologically impersonal but none the less self-centred encounters into a textual output. Denzin's manifesto complements Latour's and Bennett's call to attend to nonhuman agencies<sup>42</sup> thus transforming practice-led encounters into accounts of interactions and connectivity between human and nonhuman participants.

Technology is complicated and confused by synonymous references to generalisations of technology and precise descriptions of technologies. There is a further obscuring by media representations of place, such as the photo collections in section 1.2, and the social construction of time and space, as revealed by the encounter with assisted GPS in section 3.2. The complicated nature of technology combined with media—and a human tendency to defer to automagic—motivates this project's aim to critically engage with and reinterpret the indescribable nature of media and technologies that enable Augmented Reality. The encounters are a vehicle for that critical engagement.

---

<sup>42</sup> Culminating in the staged debate in section 4.1 between Latour, Bennett, Bryant and Barad.

The critical engagement via encounters demonstrates the methodological contribution of this thesis. As one example, the encounter Parsing Articulated Naturality Web in chapter five demonstrates an untangling of a problematic and confused past, present and future—a problem ubicomp suffers from (Dourish & Bell 2011). To explain further, ubicomp's envisioning of a future began as a proposal that established eras of mainframe, personal computing and a future of embedded computing but has now developed into a problematic scene setting rhetoric for research and engineering agendas whereby writing of "proximate futures" (Dourish & Bell 2011, p.23) confuses histories and futures as occurring soon and requires disentangling of fiction from forecasts (Reeves 2012). This thesis improves upon the problematic nature of proximate futures by contributing an orientation aligned to Kinsley's anticipatory knowledge (Kinsley 2012) to achieve Galloway's goal of exceeding visions by engaging with emergent media technologies (Galloway 2013). Another exemplar of this approach is the encounter An Emperor's New Clothes Materialism which incorporates material and speculative elements into an ethnographic encounter when examining eyewear or eyewear in section 5.3.

The practice of technology development typically involves the specification of technologies; intentions are recorded at the outset of development and its final state described at the conclusion of development. Development practice ensures that technologies are well specified. However and ironically, technologies are challenging to comprehensibly describe. The concept of system of systems (Firesmith 2010) has been adopted to encourage examination of technologies and their social entities, such as organisational elements of governance boards, as well as technological elements comprised of expected technical attributes like real-time data transfer. The concept of system of systems will encourage an examination of modularity, encapsulation and interoperability; an examination of technologies in technologies. However, more than a technical and analytical mindset is required to transform practice-led encounters into an atypical sociological account of interactions between human and nonhuman participants that Latour calls for and Denzin encourages.

Encapsulation and interoperability are potential indicators of automagic. The concept of automagic is recognised as a rhetorical device for deconstructing complex systems of systems revealing practices of obfuscation that may lead to technical determinism, industry power-dynamics, or technologists infusing their work with a mystique they genuinely believe in. Automagic is a challenging topic to grasp from encounters because

of the literal association with magic; a social phenomenon treated as a form of superstition (Jahoda 1970) and an irrational distinction between the natural and supernatural "resorted to ... where man's technical control of nature has reached its insufficient limits" (Tambiah 1990, p.72).

The mystique of automagic and presence of awe, wonder and marvel indicate a contrast with otherwise realist accounts of technology. This contrast, a juxtaposition of realist and anti-naturalist epistemologies, is a quality of Magical Realism which is a mode suited to exploring and transgressing boundaries; fusing possible worlds, spaces and systems (Zamora & Faris 1995, p.5-6).

Magical Realism encourages interrogation and scrutinizing of accepted realist texts and technology dependent conventions for the suggestion of unreal elements that accentuate and have the potential to correct cultural conventions (Zamora & Faris 1995, p.3; Simpkins 1988, p.143-144). This approach allows for both an emphasis on the elements of reality and the isolation of the magical or marvellous from technology-enabled subjectivities shared between practitioners and users who—like magical-realists (Zamora & Faris 1995, p.5-6; Simpkins 1988, p.144)—may be situated in a liminal territory such as the territory between place and information spaces. Buendía will help with this task by challenging conflicted realisms with the appearance of his reckless imagination. And, Denzin provides the interpretive scope for combining these aspects into an interpretive mode of engagement I explain as a fluid inter-operating between researcher, human and nonhuman participants.

The task that I enlist Denzin's assistance with is the transformation of a project with an autoethnographic hallmark that has been extended by the blueprint of practice-led research of Biggs and Buchler (2008). I am a visible and present role as researcher and I am also a member of a distributed community of practitioners that use and develop the technologies of my encounters. To explain in another way, Biggs' and Buchler's (2008) practice-led orientation is a methodological skew that grounds the biographical and autoethnographic presence of researcher during the research encounters. Those narrated encounters with media and technologies occur within a sphere of interactions as opposed to a subjective and/or social sphere of self-identification with a particular social group.

Denzin's contribution is to mitigate the risk of a biographical narrative by acknowledging the merits of an autoethnographic approach as a transformative method whereby

participation, observation and encounters can evolve into a written form. However, Latour is also required to offset a tendency to retreat back to a social setting, a setting of *Self* and *Others* that excludes the nonhuman technologies of this project and focuses on the people as ethnographic subjects or colleagues of an autoethnography. The actions that occurred between nonhuman technologies during the conduct of this project are foregrounded and pursued during the development of the text of this thesis.<sup>43</sup> In other words, the project actively cultivated interactions that generated the material which this thesis has consciously retained and presented textually as experiences of interactivity with nonhuman things.

The encounters between researcher, site, scene and things are not presented in this thesis as impassive observations or procedural descriptions of technology use. The encounters are instead presented as episodes, sketches and tales<sup>44</sup> of interactivity between researcher and technology-enabled things and guided by the informants. To only write what I see would be self-limiting, a restriction to the exterior of those objects and things, an omission of those prolonged exchanges as researcher, site, scene and thing interact. To strictly adhere to the inscription of observations in written form omits much as the qualitative coding of informant interviews in appendix two reveals and the encounters with a photo collection in section 1.2 or with assisted GPS in section 3.2 demonstrate.

There is another textual dimension to this thesis to unite encounters and informants. A tale of the introduction of technology to a community is developed from the magical realism of Marquez (2009) and reactions by Fuguet (2001) to become a counter-factual narrative that parallels the encounters and theoretical development of the thesis. This counter-factual narrative was introduced in the prologue to the thesis. The multiple sites of this literary construction are Marquez's village Macondo, Fuguet's transnationality McOndo and my constructed destination m.com/do. This narrative develops, like the community it is embedded in, evolving with the changing of global technologies to finish at the contemporary address of m.com/do.<sup>45</sup> That location is a symbolic web address. The .com is a recognisable notation and 'm' a convention used at the time of this research project to address mobile versions of web sites.<sup>46</sup>

---

<sup>43</sup> An example of this is Witnessing Assisted GPS in Section 3.2.

<sup>44</sup> These narrative formats are guided by Emerson (1995).

<sup>45</sup> This address is further developed in section 2.3 as a digital ethnographic place (after Pink 2009 & 2013).

<sup>46</sup> Media queries surpassed this practice by the end of the project thus providing another era for future research to consider.

A forward slash is familiar but specific to this is the active /do address of a REST-like architecture.<sup>47</sup> Within this counter-factual narrative set in the infamous literary location of Macondo are few characters but many actants. A number of characters have been rediscovered in the text of Marquez (2009) so as to introduce both human and nonhuman inhabitants of Macondo as actants in m.com/do.

The use of a literary text is a device to announce the arrival of objects and things that so typically blend into the background of sites and scenes. These objects and things are explained as:

Advanced constructs ... things that people make ...the idea of technology is that it is newish... a prescribed kind of facility ... some sort of tool that has a relatively known capability ... performs certain functions.

(quotes 1, 2 & 13)

There are both human and nonhuman others in this project. I am not alone with these technologies and nor are they alone with me. These technologies have company: the contemporary descendants of the Macondo gypsies.

The layering of the thesis occurs by a periodisation of technological concerns and interests across three eras of technological development. The tale begins with the question of infrastructure and technology-enablement introduced diacritically to the observation of consumption in the village of Macondo by the main character: the patriarch Buendía. The question of infrastructure or driver of consumption emerges from Buendía's observation of children taking a ride on a magical carpet. The later period is a contemporary technological incarnation of infrastructure and technology-enablement: the automagical places and information spaces of m.com/do. The intervening period between those two distant eras is McOndo: a time when travel is global and occurs by movement or image.

The village of Macondo is another setting for our examination of technologies as they contribute to the development of this archetypal setting. The village of Macondo is another place of competing realisms, where a trickle of blood defies the laws of physics and age does not parallel time. The village of Macondo is a fictional place constructed from events with some basis in reality to further erode the slippery distinction between fact and fiction. The insights from this fictional account in the prologue are an

---

<sup>47</sup> The relevance of REST as an architecture for interoperability is explained in section 2.3.



intertextuality, encouraged by Denzin, but not such a far-fetched literary influence considering Conrad's influence on Malinowski (Thornton 1985).

This thesis establishes an imagined arrival on the bank of a river of clear water that runs along a bed of polished stones to frame observations of inventions that arrive periodically with a visiting family of ragged gypsies as encounters that narrate technological development. The role of technology in Macondo was introduced in the prologue with the arrival of the gypsy Melquiades bringing with him the technology of magnetism. The prologue then fast-forwarded to an alter-cultural-realism of McOndo, a trans-national place of Condo's and VHS. The journey in the prologue finished after travelling from the technology of Macondo to the contemporary global village of m.com/do. Our relocation to this contemporary location of m.com/do was enabled by the contemporary descendants of those Macondo gypsies who have become informants to the thesis.

McOndo is an intervening era also sourced from fiction and set in a period of conscious globalisation (Fuguet 2001). Fuguet's McOndo is a counter-modernisation to Marquez's tale of modernity. Fuguet's period recognises the global distribution of cultural representations and things such as McDonald's restaurants and Apple Mac computers. Marquez's account of modernity is the connecting of his remote village of Macondo by train to an outside world as the international banana company transform the village into an outpost of multinational enterprise. The periodization of Macondo and McOndo does not prophesize the arrival of m.com/do. Perhaps the personal scale of McOndo technology, such as a Walkman audio player, suggests a trajectory for a personal scale of technology that eventually reaches the hand-held scale denoted by the 'm' in the address of m.com/do. Both are scenarios of mobile technologies, the Walkman and a contemporary smartphone accessing an m.com/do web site, but they both represent remarkably different mobilities. A portable audio player is remarkably different to the experiences afforded by a smartphone. A Walkman does not prophesize a smartphone simply by having a comparative scale. Perhaps Macondo and McOndo are not that different when local and global villages are surpassed by the REST-like remote procedure calls that are the interoperable communication between technologies and a hallmark of the m.com/do era. There is a difference between Macondo and McOndo but is it the substantive difference that a contemporary m.com/do offers?

Exchanges are made with ease in an m.com/do era. It is a period mostly because it is no particular place. It is an event-oriented time. Exchanges are made with ease without the need to travel through a swamp as Buendía does when seeking instruments of progress

although gypsies still arrive and herald progress with fanfare. One such exchange without any form of travel is the query and responding result-set. A typical example of that exchange is an encounter between a person and a search engine. A term is used to prompt the search engine for matches. A term is the query although it may be more than a single term. A query could be multiple terms combined in a particular sequence and within certain conventions such as quotation marks for a continuous phrase or even could be a meaningful phrase such as a posed question. Unpacking a search term reveals that the capacity of a search engine's input far exceeds the simplicity of a single word. The capacity of a search engine's query string extends to multiple words. An exchange of this m.com/do era is a query and a response.

This simple example of a web search has reinforced the base architecture of the world wide web. That base architecture is an asynchronous stateless query-response architecture that I cast in contradistinction to the eras of Macondo and McOndo. For example, McOndo is a time of corporate networks for the centralised real-time transactional systems considered by Castells as the basis for a network society. He reviews the new spaces of production emerging from new functional linkages enabled by office automation of the 1970s (Castells 1985, p. 14) to identify how the impact of those new technologies of that time are just as applicable to private lives as they are to work-oriented organizations (Castells 1985, p.18). His notion of Flows is not irrelevant but there exists a difference to examine for the contemporary period of m.com/do. Instead of building on Castells' technologies of office automation and networked organisations the thesis instead examines how an extensive network of data driven asynchronous query and response chains underpin technologies that enable Augmented Reality. What is examined in chapters of the thesis is the tangle of contemporary forms of connectivity. The multiple technologies of Augmented Reality layer many realisms that are human constructions of nonhuman objects and things tangled amid human relations. Augmented Reality and m.com/do is not a distanced and remote virtual reality. Those multiple realisms are signposted by the reckless imagination of Buendía to indicate their instability and potentially conflicted state: a state that is susceptible to imagination and explanations of automagic. Again I turn to Denzin for guidance on the textualisation of social instability.

Denzin provides encouragement to navigate what he and colleagues refer to as a third conflicted methodological moment (Denzin 2010b, p.19). Denzin echoes Mills asserting the importance of "point of view and methodological attitude" (Denzin 2010b, p.9). Denzin's critical methodology "enacts its own version of the sociological imagination" (Denzin 2010b, p.10) through the work of "interpretive bricoleurs" (Denzin 2010b, p.15)

all of which is occurring and needing to evolve within "competing fields of discourse [while] searching for a new middle, moving in several different directions at the same time" (Denzin 2010b, p.19) to compete with and define one another (Denzin 2010b, p.19). Denzin reminds of a methodological disruption that may lead to a confluence of approaches between the "mixed methodologies and calls for social justice inquiry from the critical social science tradition on the other" (Denzin 2010b, p.19). This is the starting point of his argument and the departure point between Denzin and myself, between his performative intentions and this project.

I revel in the conversation Denzin expands and the spaces he creates "within the large, global community of qualitative inquirers" (Denzin 2010b, p.32) but this project does not attempt Denzin's global crusade. This PhD project has no intention of testing the accumulating methodological conflicts recounted by Denzin as eight historical moments of qualitative research stemming from traditional through modernist, blurred genres, crisis of representation, postmodern, post-experimental, methodologically contested present, to the current moment of future which "confronts the backlash of the evidence-based social movement" (Denzin 2010b, p.13). This project instead attempts to follow Denzin's helpful lead into the new middle he points to so that I may construct and enact a critical response born out of the interpretive bricolage Denzin promotes.

The new middle I seek for this project weaves between aims of transformation and reconstructed understandings held respectively by Critical Theory and Constructivism and does so with both an activist advocate voice and as a passionate participant (Guba & Lincoln 1994, p.112). I argue for a fluid inter-operability as I descend the stratified constructions Bhaskar (1986) identifies as 'fact forms', intrigued by the detail generated from encounters that self-obscure their tangled associations, to reach an ethnomethodological point. I stage a Tardian rebound (via Latour 2009) to move from specificity into abstractions as I develop the interpretive framework of this thesis from propositions. The middle I occupy seeks evidential datum but realises those 'fact forms' are constructions of technology-entanglement.

This expansive methods section finishes having outlined methods and established associations (as a biography of this project) with established research methods. An extended focus on membership, limitation of participant observation and the textual analysis of informant interviews completes the introduction of key characters to this thesis: the contemporary descendants of the Macondo gypsies. The final explanation was the transformation of encounters to the layered text of the thesis. Chapters of the thesis are introduced next.

## Chapter Outline

The introduction has established this thesis as an examination of the media and technologies that enable Augmented Reality. In other words, a critical response that is different to an analysis of digital media items or the use of Augmented Reality software. This examination begins in chapter one where accounts from research encounters expand from corporeal travel to include distributed image collections and layering by Augmented Reality. Being augmented on Atiu did not begin with the iPhone in my hand nor was it restricted to simple observations of a hand-held device. The combination of free WIFI and photos of distant places of interest both combined to enable my becoming augmented in a place I had spent days travelling to reach. The encounters in chapter one establish those successive stages of corporeal travel in section 1.1, digital photo collections in section 1.2 and the use of Augmented Reality in section 1.3. The encounters occur via an ethnographic approach (explained previously in the methods section) and are given downward momentum by Manovich's (2008) and Fullers' (2008) software studies. The trajectory of an image is transformed from a visual surface to a realm of *specificity* that is a stratified and expansive construction of exchangeable data, material and immaterial infrastructures.

Chapter two continues expanding the reach of the thesis by plotting a descent from the global perspectives of Castells' Flows and Appadurai's Scapes to a ground-level view of converging representations of places and from information spaces. Those converged spaces are re-configured as a 'digital splace'<sup>48</sup> of connectivity and interoperability. That ground-level view is a perspective that encourages a necessary precision with technologies, similar to the perspectives and methods advocated by Kittler, Parikka, Manovich and Fuller. Their approach guides the initial theoretical engagement with revised spatial reasoning evident in technology-enabled use-cases such as Augmented Reality or the media intensive projects of Corinne Vionnet's Photo Opportunities and Jenny Odell's Travel By Approximation. Chapter two concludes by confirming m.com/do as a site of ethnographic representations, an ethnographic place (Pink 2009; Pink 2008; Pink 2013), to examine the hand-held photo collections of Augmented Reality as a 'media system of systems'.

Chapter three reveals the complication or complexity of technology-enablement. The basis for 'complication' and 'complexity' arose from encounters with technology-

---

<sup>48</sup> After Wainwright & Barnes (2009) consideration of the conflation of spaces and places as splaces.

enablers of Augmented Reality and the explanations of technologies by those practitioners who became informants to this project.<sup>49</sup> A selection of technological components from what is a collection of material and immaterial things and objects, ranging from devices to data files, was acquired during research encounters that are described in sketches and accounts throughout chapters one to five. The accounts and sketches of technological components I encountered accumulate by chapter three to now include: screens and scenes experienced en route to a remote destination; a geo-tagged photo collection; an episode of Augmented Reality; a networking project and their recommended router; a 'Street View' and invisible infrastructure; a data file of assisted-GPS.

The examination of encounters during chapters one to three combine with the reformulated materialism advocated for by Latour and Bennett. My technique of dyadic parsing for complication or complexity is realised in chapter three and provides the "grounded analysis of contemporary culture" that Parikka requests so as to better understand "the specificity of this brand of materialism" that he proposes as a "multiplicity of materialism" (Parikka 2012, p.99). To adapt for the moment Parikka's vocabulary, sources arise amongst a multifaceted network of collectives and confederations that span and move between occupied spatialities, media, technology-enabled and experiential spaces.<sup>50</sup>

Except, I also disagree with Parikka's basis and depart on my own terms with an alternative approach to the grounded analysis he finds on the multiplicity of Deleuze & Guattari's expectation that "materialism has to be invented continuously anew" (Parikka 2012, p.99). Parikka endorses Deleuze & Guattari and attempts an "upgrading" via Kittler of Foucault so as "to be equipped to tackle technical media culture" (Parikka 2012, p.96). Instead, I return to the methodological principles of Pink and I attempt as an ethnographer to participate and observe, to gather and use within a practice-led rubric of ethnographic methods, so as to develop in dialogue with informants the emic categories of *complication* and *complexity* and the constructs by which they explain the *specificity* of technologies. Chapters one to three establishes via encounters, informants and theoretical elaboration that technologies are constructed from atomic building blocks that are combined in either complicated or complex formations.

---

<sup>49</sup> Refer to the earlier Methods section for an explanation of participation by technology practitioners, their characterisation as contemporary gypsies and their analytical contribution to the thesis.

<sup>50</sup> Refer to the sources represented as a multifaceted network of collectives and confederations in appendix 3.5.

It is in chapters four and five where the encounters with complication or complexity transform into a deepening interpretation and the theorising of objects or things is tested. The development of this thesis within the remit of a reformulated materialism considers what an Object Oriented Ontology can offer as an explanation of Augmented Reality. The alternating similarities between object and thing are pitted against each other in a staged debate in section 4.1 followed by a thickening of things in section 4.2. Technology-entanglement is parsed in section 4.3 via an interpretive tear-down that is informed by Latour and Bennett's flattening and thickening of things.

An Object Orientation is reconsidered in section 5.1. These inflections of flat or thick and thing or object redirect attention from alternating theoretical perspectives back to the material and immaterial of research encounters. Chapter 5 reframes and vocalises from a nonhuman point of view what has been revealed through this project's investigation of Augmented Reality as a contemporary form of human and nonhuman connectivity. Being augmented is more than can be explained by case studies of media and technology-enabled projects or component level analysis of technologies as code or database. Being augmented is being *technology-entangled* which is a complicated or complex vitalist ontology that I argue for in chapter 5. Technology-entanglement is an explanation of technology-enablement with an anthropological and *Thingly* basis as encouraged by Latour and Bennett in chapters three and four. This explanation of a complex vitalism is an alternate ontological explanation to what might otherwise be suggested by Bryant and Bogost as Object Oriented Ontologies.

Augmented Reality is a technology that overlays spatial experiences with information. Being augmented is a contemporary form of connectivity made possible by the convergence of networked portable computer devices with integrated camera and freely available Augmented Reality software. Being augmented is technology-entanglement and with entanglement comes two forms of vitalism that are either complexity or complication. Connectivity is tangled by complication or complexity. There is a difference between complication and complexity that matters. The difference, put simply, is that complication is within human reach whereas complexity is beyond human. These are not mutually exclusive forms and one could combine with the other. In other words, a complex arrangement could include parts that are complicated.

Connectivity is revealed as more than point to point relations and as such is explained as a tangle. The term 'tangle' is chosen because technology-enablement includes forms of

complication and/or complexity that are difficult to trace, decipher and prone to explanation by way of 'automagic'. This form of magical thinking occurs when two parties agree to not request nor provide causal explanations for technology-enablement. The difficulty of this 'tangle' is accepted by acknowledging the indescribable conditions of technologies and by allowing the narration of competing realisms within the chapters of this thesis. The competing realisms are technological or imaginative as technologies are narrated by researcher, informants and Buendía's reckless imagination.

If it weren't for the turbulence of competing technology-enabled realisms and human acceptance of automagical thinking it might be clearer that technologies, those human and nonhuman configurations, are constructing a transitional milestone. The milestone occurs within a liminal period between a human complication and a beyond human complexity. The question of a human presence in a beyond human complexity is opened by this thesis. This question is suggested as a possible future project to expand the complicated or complex multiplicity of media into a synthetic ecology.

The thesis concludes in section 5.3 with the continuing trajectory of imagery and Augmented Reality. The emergence of eye-ware, such as Google Glass or Meta's Spaceglasses, suggests a continuing trajectory of a digital image propelled by data whereby vision and data converge. This emergent form of Augmented Reality eye-ware is compared in a speculative use-case to the hand-held technologies of this project. The format of a speculative use-case is chosen to demonstrate the criticality developed through this thesis: a fluid and interpretive inter-operability.

## Chapter 1. The Migration Between Place and Information Spaces

The approach of this project is ethnographic and the first task of this project begins in this chapter with the locating of this project. This chapter applies Clifford's (1997) reconsideration of what constitutes the field-site<sup>51</sup> to follow the trajectory of an image from a geographical space to a set of discursive practices that are technology-enabled.

The scene setting of the first section reveals a contemporary mobility revolving around computed information spaces and a human centric sense of place. The first section of this chapter establishes the technology-enabled sites and scenes of this project by recalling accounts of imagined arrivals that are corporeal and informational in the non-existent place of the South Seas. The real-world occurrence of these imagined arrivals is a journey I made to the Cook Islands. The role of travel in this section is to demonstrate an intersection between place and information spaces that relates to the use-case of a Panoramio photo collection as displayed using the Augmented Reality browser Layar.

The second section of this chapter demonstrates this project as operating within the rubric of fieldwork despite the problematic situating of this project in a liminal location between information spaces and actual places. The second section will curate a photo collection on the island of Atiu as an informational view of a place.

The third section is an account of an alternative spatiality revolving around a collection of photos. The third section provides an account of Augmented Reality that again examines the migration between information spaces and places. Photos of Atiuan places of interest are layered onto smartphone mediated observations of Atiu.

### **1.1 Sites and Scenes of Technology-enablement**

Imagine yourself suddenly set down. Imagine yourself as Ethnographer "suddenly set down surrounded by all your gear, alone on a tropical beach close to a native village while the launch or dinghy which has brought you sails away out of sight" (Malinowski, 1961, p.4). Imagine that isolation as you arrive at your destination arriving to a limbo between where you came and what you belong to and the destination you are yet to enter. The imagined landing is an attempt to overcome the boundaries that exist between departure, arrival and destination.

---

<sup>51</sup> Clifford's reconsideration of field-site was introduced in the Methods section as a way of including globally distributed informational spaces with place-based technology-enabled practice.





Figure 4 - Shining Green, Blue Sea and Alluring Clearness (Maina, Cook Islands)

This brief scene-setting establishes the methodological convention of a site occupied by 'others' and suggests the beginning of a scene with tropical beach and nearby village. The scene-setting is the beginning of a literary construction because Malinowski relied on rhetorical methods to convince the readers. He managed the imaginations of his readers by reconstructing a moment from his experiences with a narrative of his travel to reinforce his accounts (Thornton, 1985, p.8-10).

Let us imagine that we are sailing along the South coast of New Guinea towards its Eastern end ... the boundary of the district inhabited by this tribe corresponds to definite geographical conditions ... we can see distinctly the steep, folded slopes, covered with dense, rank jungle, brightened here and there by bold patches of lalang grass ... there is no pronounced dry season there, and so the land is always clad in intense, shining green, which forms a crude contrast with the blue sea ... To someone not acquainted with the South Sea landscape, the alluring clearness of the beach, fringed by jungle trees and palms, skirted by white foam and blue sea.

(Malinowski, 1961, p.33-34)

What is evident in this passage is Malinowski's evocation of place and mise-en-scene (Thornton, 1985, p.13). Malinowski entices the reader to imagine they are sailing in a South Sea landscape by sketching an alluring scene of smiling festiveness. Site and scene are beneficially tangled in a conventional ethnographic account. The characters of that account have yet to be properly introduced. The only component of an ethnographic description so far revealed is firstly the researchers presence, their gaze, as they locate themselves set down on the beach outside of their subjects village and secondly the readers imagination as it is transported to an alluring South Sea landscape.

I can easily imagine such an alluring South Sea landscape. I often travel into the South Pacific, having stayed in excess of 100 nights in South Sea villages and near those alluring South Sea beaches. Figure 4 is from my image collection and represents a beach arrival I experienced. The following encounter 'An Imagined South Seas Arrival' represents another typical arrival. The purpose of the scene-setting in this section is to properly introduce the sites and scenes of technology-enablement that are place based or dependent on information spaces ahead of introducing the associates of Augmented Reality in sections 1.2 and 1.3. I navigate the South Pacific with technologies for photography and return with photo collections featuring alluring South Sea beaches (as seen in figure 4) as well as other collections of sites and scenes one of which will be examined in section 1.2.

*Encounter I An Imagined South Seas Arrival*

Imagine being suddenly set down, amongst runway landing lights swirling around outside as the vehicle reorients itself with its renewed constraints. The Embraer Bandeirante has landed with the usual bumps and braking.



Figure 5 - View from Interior of Embraer Bandeirante

It has darkened since the airborne sunset but lights and shapes can be seen through the drizzle streamed windows beyond the wing and engine, as pictured in figure 5. The water is more than condensation drifting over the glass. Raindrops are now able to directly hit the windows as the plane slows near but not quite close enough to be a dry distance from the terminal. These changing spaces are a familiar range of places and placelessness.<sup>52</sup> I am

---

<sup>52</sup> The notion of placelessness or non-places (Augé 1995) is a useful reminder of seemingly identical and banal appearance of localities. Imagined places may also suffer from the construction of placelessness by poor rephotography.

revisiting places travelled to in 2005, 2008, 2010, 2011 and 2012. It is CKT 24 May 2012. The familiar places are sky, runway, airport terminal and the scope of these places is extended to include aviation rules that govern and guide actions within and between these spaces. Social principles soon overtake aviation rules as umbrellas arrive with friendly greetings at airplane door and wet umbrellas left wherever they land in the terminal are whisked away to their proper place behind the counter by the locals.

The beach, palms, villages of this South Seas location are nearby; a customary floral Ei is quickly draped over our necks to signal such an arrival, just as Malinowski evokes, amongst all of the aviation and social procedure. The weather is atypically bleak and locals are in winter clothing as the visitors remain undecided about temperature of this warm climate; unsure how many layers are required. Conversation continues with jovial comment about the rain, suddenness of the change, hope and expectations of fine sunshine for the guests. We are not just visiting we are revisiting. We know the importance of rain as a source of water in these places and say so to put our hosts at ease. Issuing of apologies for the weather by hosts is such an altruistic behaviour even for tourism providers monitored by government bureaus. The catchphrase from the local weather report "keeping the island clean and green" should be read by visitors as a euphemism for necessity.



Figure 6 - Motionless and Forlorn Palms 2010

We continue to imagine. It is dark and as much as can be made out from the exterior scenes are buildings dotting the roadside and passing vehicles behind their headlights. These are markers of electricity. The last arrival in darkness was after Cyclone Pat in 2010 and the motionless and forlorn palms with drooped fronds dotted our vista in stark contrast to the

typical wistful radiance of green that Malinowski persuades us to visualise. The sight of regrowth during our visit in 2011 was not enough to replace that image, presented above as figure 6. It's dark and windy tonight and I am wondering about the health of the coconut palms. Imagine that. An image is retrieved in response to environmental stimuli; in response to the absence of environmental stimuli as darkness and the sense of bad weather outside of my protective vehicle prompt for a troubled scene from our past. That visual recall was unaided by technology. There was no Augmented Reality on that island. Still, these image collections were layers: they were layered upon my gaze.

Travel is helped by imagination because there was no 'suddenly set down' event. The sudden jolt of airplane tyres on tarmac or coral airstrip is a mistaken surrogate for a sudden arrival. We had been through multiple stages of departure and arrival already that day. The movement between stages was not instantaneous and instead there were betwixts and between for many stages. The day began with readying, leaving home, travelling, arriving at the parking service. The day continued with waiting, leaving parking service on their shuttle, travelling via domestic terminal to arrive at the international terminal. The day's travel was interrupted by the awkward process of self check-in which required more than the conventional level of human and system intervention to issue boarding passes, this marking the passing of one stage to the other as the threshold of seat allocation is reached despite this new not-so-self-service process for providing boarding passes. We still have our check-in luggage; those too-heavy items offloaded at the next checkpoint. The day continued on to immigration, passing via food court and then beyond multiple thresholds of: the gateway that non-travelling people can't pass, immigration officer who receives paper forms and checks passport, then security clearance with x-ray and body scanner although this time I wasn't stopped by the officer with the wand. The day progressed onward to the departure gate via toilets and duty-free where another threshold is passed as departure card is split in two and travellers walk down the airbridge to the plane. This lengthy description outlines at a general level the first five and a half hours of travel and there are another 45 minutes perhaps to explain before the airplane tyres lift off the tarmac at Auckland International Airport marking another of many points of departure. The multiple arrivals begin approximately four hours later while airborne and continue for another three hours.

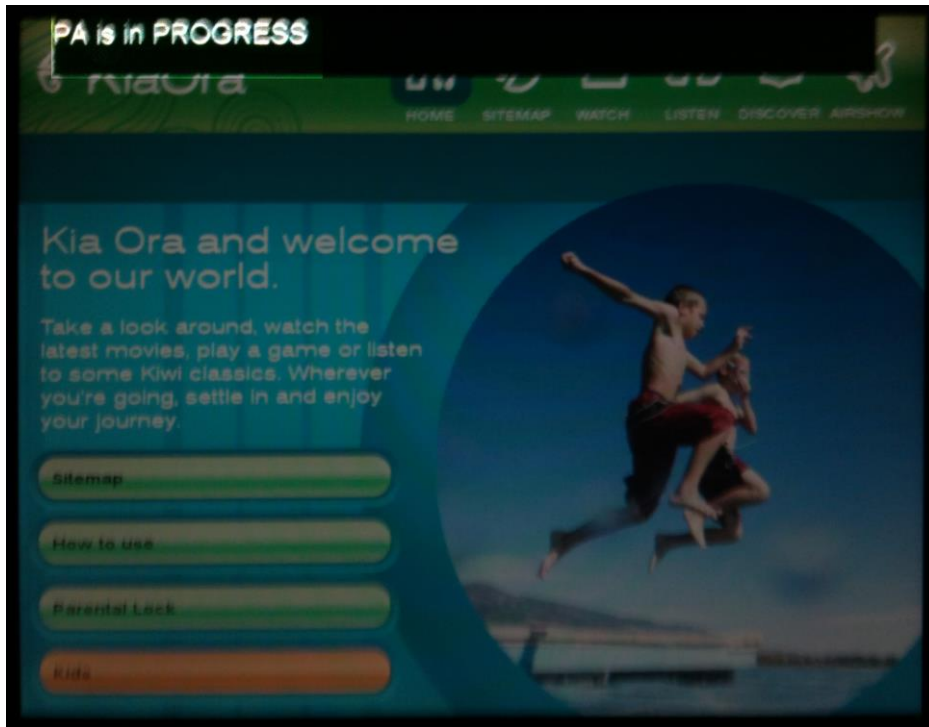


Figure 7 - Public Address On-screen Obstruction

The confusion of multiple departures is matched by a multitude of arrivals. The P.A. interrupts passenger media consumption to make announcements. The meaning of the acronym 'P.A.' somewhat lost amongst the milieu of headphones and personal screens as we sit in individual seats isolated from our closest and most intimate relationships by enough noise to wall-off those seated right next to us. What is shown in figure 7 is not really a public address. Perhaps 'personal address' would allow for continuous use of that acronym. Although personal implies a level of intimacy that isn't provided. Individuals are just itineraries en route that have been reduced to a seat number with or without privileges that have been paid for. Perhaps it is simply unnecessary to impose a message on screen featuring the acronym in the first place. The authority of the pilot and flight crew is granted by aviation rules and doesn't require on-screen endorsement by mere acronym. On this occasion, the pilot audio-visually commands our attention by disruption, only to announce the obvious: we have begun our descent. The multitude of arrivals begin and there is the illusion of a shared experience for all on-board. That illusion dissolves as a later announcement makes reference to passengers that are either staying in Rarotonga or travelling further and connecting with another international or domestic flight. We are connecting with another domestic flight scheduled for departure at 6pm and our arrival is only just beginning.

\* \* \* \*

We travel distances faster than Malinowski but our journey appears to be stilted by comparison to his narrated arrival.<sup>53</sup> His sudden arrival is as fictional as ours but the sudden relocation by way of narrated image is similar. The role of imagery to construct imagined arrivals appears to be as influential now as it was then for Malinowski.

A sudden arrival on a remote island requires imagination to isolate an arrival from the constellations of places, objects and systematisation that mark the overlapping connections of these arrivals and departures. This attention to systemisation and infrastructures has similarities to Dodge & Kitchin's case study of air travel, software and data but does not support their notion of a dyadic code/space (Dodge & Kitchin 2004). Instead, I identify here that travel is an experience constructed by image and imagination co-dependent with multiple enabling technologies and media. Tourism connects remote locations with urban spaces by the connected nodes of urban infrastructure required to mobilise people and imagination. Places are not just connected by simple point to point flight paths or sea passage. An urban car park connects remote places just as a runway does. Arrivals are imbued with an immediacy that requires suspension of disbelief so as to ignore the mundane series of actions and exchanges that accumulate during travel as a network of interactions. Corporeal mobility lacks immediacy.

A particular conception of mobility is required to accommodate the association of place to the internet technologies of Augmented Reality. Contemporary connections between places are connections made by information spaces. The information spaces of this project are those provided by internet technologies and used by Augmented Reality. Overlaps between places and information spaces are mediated by the screens of those technologies as much as those overlaps are mediated by corporeal agents of movement or regulatory order. Imagination is stimulated by information, and by narration just as Malinowski did. Imagination connects the remote sites and scenes of this project by way of information spaces however *unsuddenly* their connections might be experienced.

Information spaces create a tangle of travel, imagination and place. Clifford (1997) reminds that travel is a dislocation and I draw on that to intensify the overlapping experiences of mobilities from the encounters of this thesis. Appadurai considers mobilities of people and technology as ethnoscaples and technoscaples that are landscapes of human motion as

---

<sup>53</sup> His actual travel was different to his narrated arrival and was instead a succession of journeys from 01 Sep to 16 Oct 1914 via Melbourne, Toowoomba, Brisbane, Cairns and Port Moresby (Malinowski 1989, p.3).

persons and groups deal with realities of having to move and fantasies of wanting to move amid fluid global configurations of technology (Appadurai 1990, p.297). Urry (2002) helps connect these modes of mobilities with his attention to tourism and image production or consumption as a mobilising dynamic.<sup>54</sup> The ethnographic question of community membership will be left as indeterminate for the time being. Fuguet's image of McOndo as globally distributed purposefully expands the notion of mobilities to be neither the departing resident nor the arriving visitor that Appadurai and Urry consider.

The relevance of travel as a dislocating force is that it is foregrounded here to reinforce a discourse of action: one of destinations and arrivals. This perspective of dislocation helps decentre discourses of membership that centre around humans and their origins, such as ethnicity and immigration or tourism and visitation. Instead, travel introduces a discourse of distributed action. Imagine being suddenly set down, surrounded by the objects for your journey and reminded by the things that enabled your journey. Your passport is stowed safe and your camera is now ever-ready. The dimming memory of an in-flight announcement by the pilot that interjects on-screen makes you question the temperature. Items that were mistakenly left behind are eventually remembered and new items are acquired. Images are compared by imagination with scenes of the present to reconstruct a personal version of an imagined arrival. The lagoon is choppy. That's not the glassy image saved as my iPad wallpaper. Scene and screen are incomparable. The easterly wind blows strong, stirring memories.

Clifford (1997) suggests it is possible that a contemporary examination dispenses with actual geographical boundaries because they introduce cultural pressures that form an ethnographic bounding. Clifford's suggestion is aligned to this project's adoption of a non-sited paradigm and so travel only serves as a starting point in this thesis to provide access, in other words, a theorised arrival at places and information spaces. Travel is presented in this chapter as a shared experience that is a place to access information spaces. A project examining places and information spaces requires a non-traditional approach to determining a field-site. An accumulating array of imagery is acquired at a variety of sites with real or informational fragments found everywhere and collected as material and immaterial evidence of Augmented Reality. The technologies of Augmented Reality do

---

<sup>54</sup> The examination of im/mobilities in a photo collection in section 1.2 and the augmented in Atiu encounter in section 1.3 illustrate contemporary forms of Urry's mobility that are set in Appadurai's fluid global configuration of technology.

shape the sense of mobility this project pursues as a distributed and interactive fragmentation of media and experience. Elements as detailed yet misplaced as the acronym P.A. are isolated from situ and collected under the rubric of fieldnotes. Just imagine yourself seated on an airplane or sat down at a computer or standing on grass with smartphone in your hand. Consider this non-sited project location as an augmented space mediated by screens that reconstitute a combination of site and scene. Travel is an accessible point to begin this thesis but this project's location is not exclusively geographical. The ethnographic bounding of this project occurs via a continuing series of encounters that form a series of layered realities that are augmented.<sup>55</sup> The first encounter was an imagined South Seas arrival in this section and in section 1.2 the encounter of an informational view of Atiu will extend from the images of imagined and real arrivals to an image collection with embedded geospatial data.

The role of travel in this first section has created an intersection between place and information spaces. The intersection between place and information spaces is an intersection of reciprocal imaginations. These imaginative realms between place and information spaces are not an interior human realm. Entering the suggestively calculable space of information spaces to explore intersecting imaginations is an attempt to escape human-centric subjectivities and is not a journey into a human mind as might be suggested by an interest in imagination. These imaginative realms are exterior to our 'selves' and inclusive of the many objects, things and environs around us. Or to invert that statement<sup>56</sup>: the many objects, things and environs that our 'selves' congregate with.

## **1.2 Picture This, A Distribution of Sites & Scenes**

That sudden arrival in the previous section was at an island in the South Seas. It was a biographical account and withholding the name reminds of the risk of placelessness<sup>57</sup> in our accounts as typical sites and scenes, palms and tarmac, are recalled in a way that neutralises their place constituting importance. Perhaps stating the date and time was enough to render the account real; to suggest a realism amid that imagining. Next, we will go somewhere else, somewhere specific. Join me on the island of Atiu in the South Pacific.

---

<sup>55</sup> Recall Bhaskar's de-anthropocentrism from the introduction that I translate to the realism(s) of technology-enablement that are human constructions of nonhuman objects and things which endure and operate independent of and amid human relations as imaginative representations.

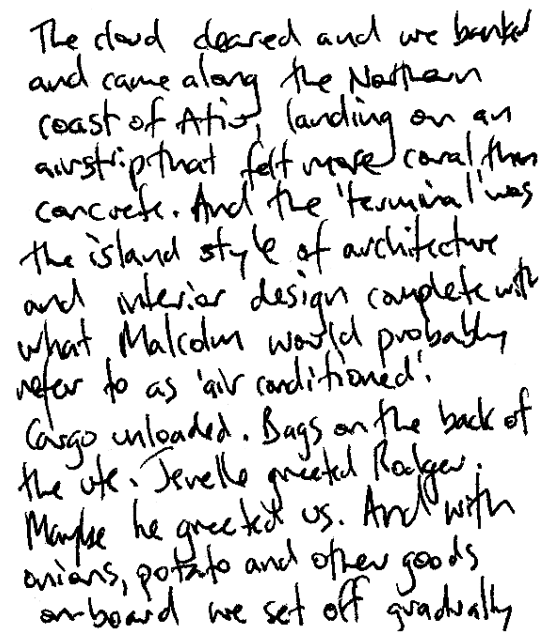
<sup>56</sup> To pursue Bhaskar's de-anthropocentric shift and an exteriority of objects.

<sup>57</sup> Where the consumption and re-photographing of imagined scenes creates self-reinforcing visual conventions.



Join me on another leg of the island hop where information spaces and places intersect.

There is a lot that could be said about Atiu. A lot can be said about experiences on the island of Atiu when transcribed from our daily journals where entries such as the following page in figure 8 narrate events and observations, recording a biographical record of sites and scenes:



The cloud cleared and we banked and came along the Northern coast of Atiu, landing on an airstrip that felt more coral than concrete. And the terminal was the island style of architecture and interior design complete with what Malcolm would probably refer to as 'air conditioned'. Cargo unloaded. Bags on the back of the ute. Jewelto greeted Rodger. Maybe he greeted us. And with onions, potato and other goods onboard we set off gradually.

Figure 8 - Journal Entry for Arrival at Atiu

Instead, I will attempt to sketch an informational view of place derived from a sub-collection of photos taken on Atiu. This is an interim stage between an observed reality and an augmented reality. This interim stage is a useful transition through a process of creating media embedded with geospatial information as I develop and refine an alternative vocabulary that takes account of the information spaces that relate to this place: the island of Atiu. The journal entries demonstrate a richness of description, a personal meaningfulness, even a shared meaningfulness with fellow travellers who descended caves or sought out coral gardens. A temptation that will be resisted is to imprint the images of that collection with that meaning. Instead, an account inclusive of the technologies is provided.

Now imagine yourself suddenly set down at another site. This site is a contemporary time and space with evocative scenes and memorable journeys similar to Malinowski's project regardless of the dissimilarity to his destination and method of transportation. The spaces perhaps alien when compared to the evocative South Sea landscape we just visited. Still,

these spaces convey with rich detail and vivid description the scenes of people and their places. Imagine yourself set down, quickly engaged and fixated with the photo collection of Panoramio user 'neuseeland77'. Imagine yourself set down at a computer.



Figure 9 - Panoramio Page for User Account neuseeland77

The site we have just set ourselves down at is a space pictured in figure 9<sup>58</sup> containing mechanical and informational interaction of keyboard, mouse, and the gaze between screen and end-user. This site is a fluid space with elastic boundaries that stretch and encompass, flexing around dispersed information and distributed asynchronous spatialities. The first task of this project is to describe this site we have been set down at: a site now shared by researcher, reader, one of its inhabitants (neuseeland77), keyboard, mouse, screen, end-user. This site lacks the convention and conveniences of a specified geographical location inhabited by a distant community of Others that can be travelled to and observed through participation. This is a distributed field-site inhabited by technology-enabled Others.

This section describes the distribution of scenes that are bounded by a single geographical location. These scenes remain connected and perhaps those scenes imaginatively retain a sense of their source location or lose it to a digital form of placelessness. The scenes are connected to remote spaces that are informational, technologised and place-based. In this

---

<sup>58</sup> Map data ©2013 Google.

section are two encounters that describe a collection of photos taken from a single site using a specific camera that records the geospatial location of that camera.

The term 'distribution' needn't always be bounded by land, or as for this occasion, bounded by the watery expanse and force of the Pacific Ocean. The distribution of information spaces helps place to exceed or disperse beyond physical constraints and to move by immaterial and material means. Photography is distributed by immaterial means such as software and material substances such as bundles of telecommunication cabling. The first encounter of this section accesses a contemporary and vastly distributed mode of site and scene by examining a photo collection acquired from a visit to the island of Atiu in the South Pacific from 12 to 17 May 2011. The analysis is of a sub-collection of images shot with a Sony HX5V camera. The reason for this narrowing to a sub-set of images taken with this single camera, a sub-set of scenes, is because the HX5V has a GPS receiver that encodes each photo with geospatial data. The precise location of each scene is calculated by the camera from data transmitted by satellites in orbit and then embedded in the image file. The remote places and technologised information spaces of this non-sited encounter is a collection of: images, the HX5V camera, photographer mobility, Exif data embedded in each image, and the GPS satellite constellation orbiting overhead.

*Encounter II An Informational View of Atiu*



Figure 10 - Suddenly Set-down on Atiu

This encounter begins when suddenly set-down on Atiu's coral runway at CKT11:48:12 12/05/2011 (see figure 10). This is the date and time recorded in the 'Date and Time (Original)' Exif data field for the first photograph of Atiu using the HX5V. This datum is one

of 116 fields recorded in the Exif data for each photo. This data structure is based on the Exif specification (JEITA 2002) which is a standard format for storing data in digital photographs that can then be accessed and used by systems external to the digital photograph and source camera. Exif data enables interoperability which in this use-case is an interaction between image and systems.

On this occasion, for this single photo, this data is not a database—yet. The Exif data of this single image is not a database because it is merely a single set of data embedded within the photo's JPEG file format. It is a single record discontinuous to other images. A collection of images could potentially combine as records in a database if their visual and data attributes were united in a way that preserved their independence and created a uniform means of access. Perhaps then a parallel Atiuan site would be that database of locations. Perhaps that informationalised site could then be treated as a cultural site,<sup>59</sup> a non-sited place, or a conflation of both such as the aptly conflated notion of a 'splace' (Wainwright & Barnes 2009). The conflation of spaces by the technologies of this project will not be labelled as a social or cultural form and instead the ambiguity for now will be retained and these conflated splaces considered as digital splaces: an informational view of Atiu.

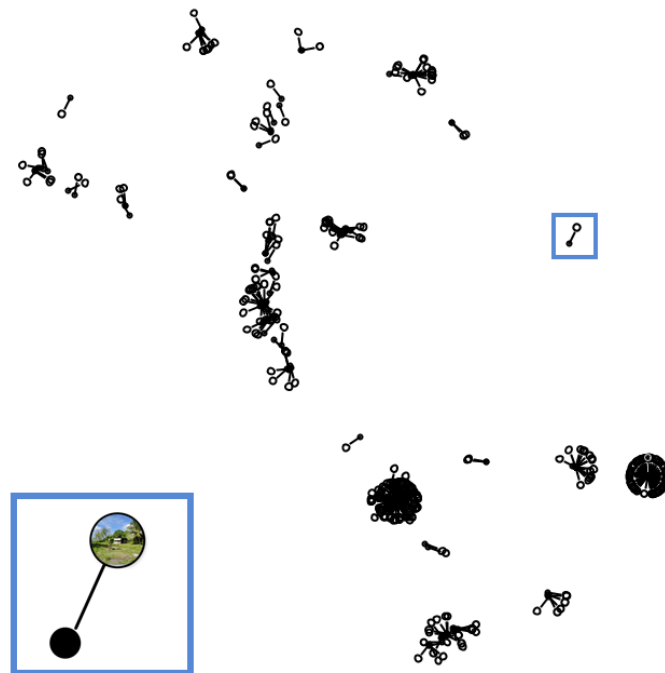


Figure 11 - An Informational View of Atiu

---

<sup>59</sup> Here I recognise Manovich's consideration of a database as a cultural form with "collections of individual items, with every item possessing the same significance as any other" (Manovich 2001, p.218). Except I also recognise the role of a database table.

The datum of each image is programmatically extracted and combined to become united and connected. This analysis unites by a combination of researcher actions and series of computed sub-processes. The image collection is processed to become a folder of image and associated text files in a directory to transform it into an ad hoc database of items that can be programmatically accessed so as to spatially plot that image sub-collection in the geospatial visualisation seen in figure 11. The technologies used were 'ImageJ' to batch process the image sub-collection extracting geospatial metadata values for 'location' and 'heading' from the Exif data for each file and 'Processing' to create the visualisation of images using image files and their associated geospatial metadata. Each photo plots two joined circles with the black circle marking the site based on the camera's GPS location and the white circle representing the directionality of the photographed scene based on heading data (as shown in the inset of figure 11). The visualisation demonstrates an intensity of scenes at photographed sites.

The images are socially united and connected when globally distributed using the internet as an enabler. Uploading these images to a web site such as Panoramio could be one of many ways of sharing this image sub-collection so as to unite the discrete image files within a greater collection just as the user neuseeland77 has in figure 9. First, as a sub-collection owned and therefore authorised by an account. Second, each image disassociated with its parent sub-collection and recombined recursively with other data driven attributes from the images (such as by geospatial association or system privileges) as images are selectively shared. For place to become a contemporary technologised form, such as a globally networked and interoperable digital splace, it requires more than an imaginative association with some place suddenly set down: it requires system administration skills.

The sub-collection continues with dozens of photographs shot each day between CKT08:29:36 and CKT22:07:17. Time is a useful attribute to reveal what has been previously summarised as a non-geospatial sense of place with a precision of minutes and seconds (Fleming & Nicholson 2013). Previous ethnographic work explored a distributed co-presence established by the intersecting chronologies of self and others known to be travelling at the same location (Nicholson 2010). That analysis did not have access to geospatial data received by an on-board GPS chip and embedded by the camera in each photo which is what has occurred for this sub-collection of photos from Atiu. On this occasion the precise location of a distribution of scenes is revealed by the discrete datum extracted from the photographic collection. The contemporary role of an image has evolved

from rendered scene to become a conduit for datum in our vastly informationalised lives (Fleming & Nicholson 2013).



Figure 12 - Arrival and Disembarking

Comparing the data of two images also informs what is not photographed. The first image on the left in figure 12 occurred at 19°58'1.344S 158°7'31.044W. The focal length was 12.85mm which is equivalent to 75mm on a 35mm camera lens. I was trying to focus beyond the glass of the airplane cabin window. The aperture was '10' but that is of no consequence for this image. The HX5V is a compact camera and I usually have it set to an automatic mode as was the case for this first image on Atiu. The 'Exposure Program' field in that image's Exif data more accurately and in its own understated way identifies the mode as 'Program normal'.

The next photo (on the right in figure 12) was 2 minutes 24 seconds later. Within that time I had disembarked and crossed from the concrete pad the airplane parks on, onto the coral runway, toward the open-air terminal, before spinning around 180 degrees to photograph the airplane exterior. The ground crew are almost visible as they unload freight from the cargo door on the other side of the plane and another passenger is also in the frame but their fellow traveller is dissected. What was not photographed but revealed by this data analysis of images presented in figure 12 was my disembarking. Data has had an additive effect.

\* \* \* \*

The image is mundane but not a representation of placelessness. Continuing to describe these encounters at this place following a stepwise re-creation of these experiences would be a chore and become a travel bore thus risking the reduction of this place to an informational placelessness. Here again I remind of the travel journals rich with description

that are not treated as a source for this project. Site and scene is sought by inspection of the interoperable technologies that are enablers of these images.

However great the risk of boredom, the brief narrating of datum materialises invisible attributes of place as found in the images of this sub-collection of imagery. The comparison of date and time fields that were used to calculate time deltas has helped to inflect a non-linear momentariness back into the photographic event: I had disembarked and crossed from the concrete pad the air-plane parks on, onto the coral runway, toward the open-air terminal, before spinning around 180 degrees to photograph the air-plane exterior with the artificial sound of a 'zibp' marking what was on this occasion a 1/400 of a second duration within a series of events with a combined duration of approximately 2 minutes 24 seconds.

The duration of my disembarking—a discrete event within the symbolic 'suddenly set down' arrival— is a brief period but an extended one with the capacity for another 57,600 images to be taken at 1/400 of a second if only the technologies could sustain such throughput. This calculation and consideration of 'throughput' a timely reminder that these interoperable image technologies have components with constraints. The processing speed of multiple components supports the writing of the file to memory. A cache is one component that acts as a buffer by holding the image in a temporary mode of storage between the moment it is taken and the moment it is stored and a cache has a constraining capacity. The consideration of 'throughput' is merely one concern when evaluating the qualities of systems of systems (Firesmith 2010).

What is suggested by this informational point of view is that a reminding of the durational basis of imagery helps to inscribe with the precision of minutes and seconds an event. That event — to subscribe to Pink's (2011a & 2011b) and Massey's (2005) notion of place as event driven, processual and moving — potentially constructs or at least contributes to a sense of place as a manifestation of informational exchanges. What is also suggested by my analysis, is that this event oriented occurrence of place is manifesting as a series of connected events amid a multitude of components: a fragmented and partial representation of place manifests within the illusory real-time layering of media.

Having established a data-led rift, I will continue to examine a precise encounter with place that I present as a digital equivalent of gaze.

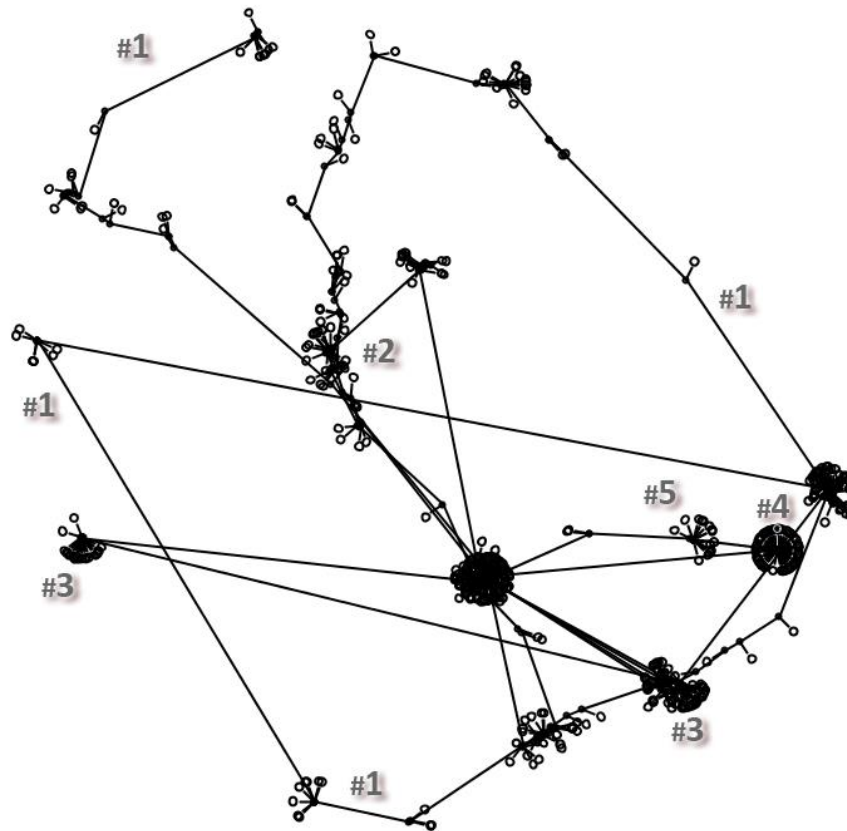


Figure 13 - An Informational View of Place Revealed by a Digital Gaze

At this point, the representational form of a photographic image gives way to a visualisation of this sub-collection of geotagged photos. The visualisation in figure 13 corresponds to place-making by movement and image (Pink 2013) and the tracing of eye movements and media (Redmond & Vita 2013) that follows what Henderson might explain as a mode of task-related gaze control to construct specific sequences of fixations (Henderson 2003, p.501). A satellite perspective of task-related gaze control has been created by photography on the ground.<sup>60</sup> The satellite perspective of this human and technologised vision over prolonged periods of time is plotted as an unconventional representation of gaze complete with saccades and fixations<sup>61</sup> (i.e. the routes and sites) to demonstrate photographer and device manoeuvring around Atiu.

---

<sup>60</sup> Contrast this visualisation to the INmobility project (Paraguai & Costa no date) which creates a graphed image based on the conventional gaze of a camera view. The INmobility project processes the visual scene of a conventional camera view whereas this informational view of place is created by plotting data from each image that was created by on-board GPS and clock of the camera.

<sup>61</sup> Alternatively this representation could be inspected as a meshwork to reveal multiple zones of entanglement (Ingold 2008) where each site with tendrillous scenes is what Ingold might interpret as a tissue of knots.



This satellite perspective of a technology-enabled gaze is unlike Henderson's conventional examination of the different gaze patterns of real-world scenes and depictions (Henderson 2003; Henderson & Ferreira 2004). The key difference is that this satellite perspective of human gaze in real-world scenes is based on a hybrid of both real-world views and scene depictions that are also tangled in a form of task-related gaze control. In other words, real-world scenes are re-viewed as depictions in preview mode and reviewed again once photographed on camera mounted LCD screens. Scenes are conflated. A photographer's place-making gaze is tangled by datum with technology enablers. This view of a technology-enabled digital gaze that emerges from a photo collection is incomparable to the conventional singular view a photographer would have via camera technology (an example is illustrated below in figure 14). Instead, figures 11-13 are examples of the construction of a digital splace.



Figure 14 - A Conventional and Singular View of a Photographer's Gaze

This unconventional visualisation of place-oriented technology-enabled gaze (figure 13) reveals with each appearance of a saccade or fixation the mobilities of person, place and technology. The perimeter of the island takes shape [#1], the roadway through villages in the centre of the island [#2] and the small beaches [#3] are all revealed by a density and a distribution of photos: a series of technology-enabled mobilities that intersect with geography. However, the density of photos marking the caves [#4] reveals a clash of human mobility and nonhuman immobility. This immobility demonstrates what Jensen explains as a transgression of a sedentary/nomadic dualism to reveal "geographies of material, emotional and imaginary sorts created through networks of connectivity that transcend place as an enclave" (Jensen 2009, p.143). The visualisation suggests the photographer rotated in a single spot taking photos at every turn which does not demonstrate the 30 minute hike under the cover of trees [#5] and movement across ground to travel between a series of caves. The nonhuman immobility revealed by this density and distribution is a

collusion between GPS and camera. The GPS signal could not penetrate the tree cover overhead and the decision of the camera maker was to retain and continue to store the previously-triangulated data in each successive image (Sony 2010, p155). We were moving but the technology was rooted. The collusion between GPS and camera is easily lost in the conflation of place and information spaces: concealed within the layers of digital splaces.

\* \* \* \*

The observational mode of corporeal travel from section 1.1 has been transformed in this section. Travel has been abstracted to an interest in routes. Clifford helps our translation of travel to routes with explanation of routes as a manifest form of enablers or constraints affecting movement across and between borders (Clifford 1997, p.6). The encounters have provided a new representational strategy that Clifford calls for (Clifford 1997, p.25) to examine im/mobilities of technology-enabled routes by visual analysis of place-making (Pink 2008; Pink 2013) within a globally distributed contemporary field-site that engages with the "complexities of cultural localization" (Clifford 1997, p.29) enabled or constrained by global media and technology. The visualisation reveals the technology-enabled practice of locative media as a negotiation between remote geography, GPS and camera manufacturer to navigate between conflicted enablers and constraints.

There are insights from this section to carry forward. I have previously considered how that image datum could induce the momentary precision of minutes and seconds into a collection of photos (Nicholson 2010; Fleming & Nicholson 2013). What I hadn't previously seen for myself was how a single collection of photos could saturate a place so small and bounded as the island of Atiu. Perhaps there is more to see, more insights to be found in further analytical encounters with that collection of photos, more to be revealed about place and information spaces as captured by a camera. There are 116 Exif data fields to interrogate and plot into visual interpretations of place but a camera with its Exif data file is one of many technologies, or possibly it is two of many technologies. The camera and JPEG image file and Exif data structure are three technologies, and, technically, many more exist if their constituent technologies are revealed. These (and many more) technologies are part of a technological chain encompassing places and Information Spaces. This technological chain—these connected technologies of camera, image and geospatial datum—combine into a layered re-presentation of a place on screen to connect sites and scenes in-situ with things from information spaces.

This chapter has expanded on the contemporary practice of travelling, visiting and photo taking to also situate this encounter within the discourses of technologised and global Media. The key point to reinforce is that this section has examined photographic practice to reveal the presence of datum and how that data intensive photographic practice occurs within an expansive array of technologies. Image creation has become data creation and that datum is a key to interoperability: a key to connectivity. From this point it is possible to re-encounter a contemporary sense of place through continued exploration of technologised site and the distribution of scenes.

The next section reconsiders a sub-collection of photos informed by insights from section 1.1 and section 1.2. The preceding sections have anchored the contribution of imagination to place when situated within this vastly distributed technology-enabled practice: when places and information spaces connect and are conflated as digital splaces. Here also we need to be careful of the shifting role of imagination: from its contribution to 'sudden' travel and to the use of imagination to reinforce a misunderstood sense of technology-enablement as connections between place, space, information spaces and technologies. Buendía's reckless imagination is a constant threat but there must be more to the connection of these sites, scenes and things than an automagical explanation.

Next, I will briefly extend these contemporary image making practices into contemporary processes of image consumption that are data oriented, technology-enabled and connected. The next section will take a closer look at this chain of connectivity and its augmented things as a precursor to a critical review of a collection of configured *things* in chapters three to five.

### **1.3 Augmented in Atiu**

Imagine yourself suddenly set down again at another site. This site is a contemporary time and space with evocative scenes similar to Malinowski's project despite the dissimilarity to his arrival. Except now these spaces are increasingly alien when compared to the evocative South Seas landscape we just visited in section 1.2 because more technologies have been added. Section 1.2 examined photographic practice and in this section we consider hand-held Augmented Reality. These spaces convey with the same rich details the scenes of people and their places. Imagine yourself set down, quickly engaged and fixated with a different type of instrumentation. Imagine yourself Augmented in Atiu.

Encouraged by Bennett's attentiveness to the nonhuman I will now attempt to sense, think and narrate an encounter with things (Bennett 2010b). I will describe a thingly assemblage of site and scene with a sketch of Augmented Reality on the island of Atiu. Figure 15 captures that moment and shows on screen in my hand a number of distributed sites and scenes of Atiu. Latour's and Bennett's sensitivity to nonhuman things is deployed in this sketch of Augmented Reality technologies. I will examine with their assistance a distributed technology-enablement<sup>62</sup> and the call of those things<sup>63</sup> on that occasion when I stood on the South Pacific island of Atiu using the Augmented Reality Browser 'Layar' on my iPhone. The two encounters in this section describe another sense of place: an augmentation of place by information spaces.



Figure 15 - Hand-held Augmented Reality of a Photo Collection on Atiu

#### *Encounter IV A Layered Place*

Well there I was, tethered to a WIFI network and gazing with assistance at the scenes around me. I was gazing with the assistance of Augmented Reality.

My heading was hindered. I could not set off after the distant targets on-screen. My connectivity was WIFI and I knew its range was less than the range specified as a software setting.

The scenes were layers. There were the user interface screens to set-up the Panoramio layer on the Layar browser software. There were the thumbnail images hovering within the on-screen scene, layered in real-time over the display from the on-board camera. There were the other accompanying informational elements, possibly there to enrich the thumbnail image with title and caption, potentially distracting. There were the layers of

<sup>62</sup> Here I recognise Latour's interest in networks of human and nonhuman agency (1999; 2005; 2011) but I label my equivalent interest as distributed technology-enablement to avoid confusion between his use of network and the network technologies featured in this project.

<sup>63</sup> Like Bennett (2010), I identify the coming together of multiple nonhuman agents in a configuration that provided the experience of Augmented Reality on Atiu.

screen and screen-protector both necessitating a certain inclination to preserve the visibility of on-screen elements while outside in the midday sun. There were the layers of: the composite of all those previously described screen layers; the sights, sounds and smells of my immediate surroundings; the distances beyond my current location that I was being drawn to as the immediacy of what was on-screen exceeded what was competing for my attention in my immediate surroundings. And I am yet to include the layers of software architecture that enable the transit of request and response between the multiple server solutions of Layer publishing site on the Laya platform, which acts as something of an intermediary for the 'getPOI' calls which are all REST-like (Laya 2013), and the Laya web service on the Laya Service Providers web server (Laya 2012). In addition to these multiple server solutions is the dynamism of respective configurations made on servers and client devices that are necessary to this augmented experience of site and scene. This is a dynamic point of view of interoperable configurations. I will pause at this point to prevent a descent too far into technical documentation.

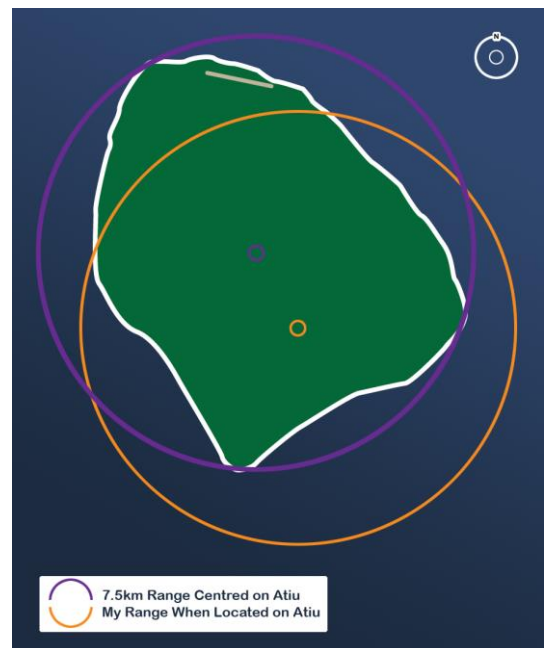
\* \* \* \*

There was no 3G cellular network coverage in the Cook Islands when I visited in 2011. Any device connectivity would be on a WIFI network and bounded by a range of metres. After avoiding the smartphone device for the first few days of the 2011 trip, I eventually tested connectivity and experimented with Augmented Reality. The two encounters in this section (above and next) are narratives of that experiment. The experiment was simply a trial to determine if range is relative to range. I have a fixed range when tethered to WIFI. I have a variable range controlled in the layer settings when using the Laya Augmented Reality browser software. For the trial on Atiu, I had a fixed geographical range, residing temporarily on the island of Atiu in the South Pacific Ocean until the itinerary of my corporeal travel commanded that it was time to depart. The trial was to determine if the limitations of WIFI range can be overcome by software range when located in a contained geographical range. I was on a property in the middle of a small island tethered to that property by the available WIFI. Could software transform my reach from that property to the circumference of that island?

*Encounter V Range as a Software Setting*

Yes software could transform my reach. The minimal range is 250 metres and maximum range is 7.5 kilometres for the Panoramic layer in Layar (as per figure 16). The diameter of the island at its widest point spanning North-to-South is approximately 7.16 kilometres and 6.45 kilometres spanning East-to-West. I was located at a property approximately 4.95 kilometres from the northern tip and 2.85 kilometres from the eastern coast. The software range is approximately that indicated in figure 16 and the geographical range limited to the green area, with some scope for travelling in the white fringe around the West to South East coastline where the coral reef and lagoon exist but not in other parts of the coast where that white fringe directly meets the Pacific Ocean. The force of the Pacific Ocean prevents movement around parts of Atiu's coast with a 10m cliff face and the surge of Pacific Ocean swells below.

Figure 16 - Software and Geographical Range



The geology of the land and weather conditions further restricted movement but Augmented Reality provided an alternate mobility. The best sighting I had of the Coral Gardens, an Atiuan landmark or 'place of interest' for tourists, was a sighting that had been photographed some time ago and posted by 'neuseeland77' on 11 December 2009. I could see their vision from 1.4km away tethered to the WIFI at Atiu Villas. Our repeated visits to the coastal location to experience the Coral Gardens for ourselves were always awash. Our range on those occasions was limited to the beach nearby or the ledge above. The surge of the Southeast swell across the lagoon was too strong for walking through shallow water across that sharp coral. From the Villas I could see a thumbnail of the Coral Garden. Simultaneously I could see road, coast, beach, airport with plane, cave interior, tinned corned beef, residences and visitors or locals. These images were the remaining visible evidence of neuseeland77, bulach, Pentaxus, benedeltanei, akwoods, ErrolHunt, Goalieken and misolsireFra— remnants of their presence sometime between 02 June 2007 and 22 October 2010. The visual saturation of the island by a layer of Augmented Reality was a surprising visual density: an intriguing intensity of photo collections as I circled around tethered to WIFI with an iPhone held in my hand.

\* \* \* \*

Now to return from that account to the task of situating Augmented Reality on the island of Atiu with an iPhone in my hand. The preceding encounters narrate what Bennett might refer to as a thingly assemblage or what Latour may call a network of actants. The appeal of an image on-screen combined with the directionality of its presentation projected my attention beyond the immediacy of my surroundings. The call of an icon exceeds the stimulus of my habitat. The presence of an icon has become more than it usually would be when presented on-screen or in any other format. This icon is extended by attributes of location to become a possible candidate for an agentic grouping that includes the expansive agencies of technology-enablement. This icon when combined with geospatial data achieves a degree of mobility allowing it to circulate and return to its point of origin. There remains a clear sense of subject tangled in this assemblage because 'I' animate these icons by combination of movement and selective attention which combines with device interaction.

The nonhuman things of those encounters prompt for attention. I look to Bennett's thing-power for insight to my animation of those icons in an affective relationship that I am drawn into by the device. The device being inspected is a constructed device and in this narration the encounter revolves around an iPhone: a seemingly untethered "great gizmo" that is an enabler of cultural mobility (Mattern 2011; Banham & Sparke 1981). The notion of a great gizmo extends *device* beyond a mere bundle of components to become a connected series of elements, technologies or things, within a cultural flow of production and consumption, within what Latour might consider a human and nonhuman network of connected actants or agentic grouping. The disadvantage of this centring on device, even as great gizmo, is that it conceals its dependence on an array of infrastructures (such as the multiple mediating server solutions of layers of publishing site and service provider on the Layar platform and Panoramio layer web service) to create the illusion that it is untethered when really it relies heavily on technology-enablers that Mattern would label an invisible infrastructure (Mattern 2011). The iPhone that provides the Augmented Reality encounter of this section is not an independent mobile device but instead this connectivity is a tangle of vastly distributed material and immaterial interoperable datum and componentry that reinforces how enablement is a tangle of many connected associates. These encounters with those enablers of connectivity reveal the presence of an expansive specificity.

What is required next is a revised positionality that relocates this researcher and those encounters generated by travelling to the places and information spaces of the South

Pacific. A revised stance could recalibrate this contemporary account of place and information spaces as mediated by Augmented Reality. Next, chapter two seeks a theoretical means to access the encounters from this chapter and to better describe the indescribable technology-enablement revealed by those encounters.

The next chapter inflects theoretical perspectives of Media into the examination of Augmented Reality as a globally distributed media system of systems. A re-configuring of those theoretical perspectives of Media informs the contemporary perspective of this thesis. What is sought in chapter two is a criticality that accounts for the use of media and technologies for spatial reasoning. What is reached is a conflation of places and information spaces by way of an augmented connectivity between the technology-enabled sites, scenes and things introduced in chapter one.





## Chapter 2. From Media to the Study of a Media System of Systems

This chapter establishes a stratified sense of media technologies in order to locate media items and technological things in relation to vastly distributed and indescribable global media. Chapter one demonstrated an experience of photos that revealed mobilities of place and information spaces. Chapter one introduced the focus of this thesis as the use-case of interacting with a photo collection via hand-held Augmented Reality. Already that focal point has been demonstrated as expansive and beginning to include a broad range of interoperable technologies that combine to enable a collection of thumbnails of Atiu to circle mid-air. The continuing chapters of this thesis pursue this broad collection of interoperable technologies in dialogue with informants, theory and practice. The following cautionary remark from an informant, a contemporary descendant of the Macondo gypsies, reminds that we need to be careful about understanding all those *things* that are found in those broad collections of technological things.

It's definitely some pretty broad collections of things that you might describe as a single technology, I guess, and I think you need to be pretty careful about understanding what all those things mean as a collection. It's pretty clear, I think, when you see or hear somebody talking about something where they've not, apparently not, got a full complement of understanding.  
(quote 20)

The remark above may seem to be for the domain of professional employment, which it is relevant to, but it is also of special relevance to more abstract levels of 'talk'. The remark identifies the importance of doing more than inspecting a single technological element for fault or function by quite deliberately looking to articulate observations or evidence of "broad collections of things" with a "full complement of understanding". This chapter will weave its way through the stratified layers of media and technology—those representations amid those interoperable things—to theoretically locate broad collections of things within a theoretical dialogue that supports the development of a full complement of understanding expected by the gypsies.

Chapter one introduced encounters with place and information spaces as a technology-enabled form of connectivity assisted by imagination. The encounters were successive spatialities of: corporeal travel, a geo-tagged photo collection and the use of Augmented

Reality on Atiu. Reconfigurations of Media perspectives are considered in this chapter to suggest contemporary responses to the discursive relations, global infrastructures, and the re-figuring of human and nonhuman relations by the technology-enabled spatialities of chapter one.

This chapter begins with a reflection on the combination of Castells and Appadurai as distant perspectives on Media. A stratification of media is briefly established as a way of relating additional explanations of technology-enabled media, such as by Manovich, Fuller, Kittler and Parikka or Corner, Lüders and Pink, to attempt to scaffold down from the Flows and Scapes of Castells and Appadurai to an earthly and grounded view. The motivation for this downward scaffolding is to better establish the association of those detailed accounts from chapter one with a suitable interpretive tier, a level of theory building, that fits within a stratification of Media Studies.

Section two shifts to an interest in the use of these technologies, to the application of a re-configured media of systems which offer alternative methods of spatial reasoning to conventional mobilities. Two creative projects are reviewed that reconstitute collections of media as representations of place. Those projects are the Virtual Travel of Jenny Odell and the Photo Opportunities of Corinne Vionnet. These two creative projects resonate with observations while augmented in Atiu in chapter one because technology-enabled sharing creates a unity amid non-places that are digital splaces. The reconfiguring of media demonstrated by Vionnet and Odell provide further evidence of encounters with place and information spaces that are enabled by expansive and distributed collections of technology-enabled media.

The descriptive material introduced during encounters in chapter one are inflected back into the stratified explanation and revised spatialities of media and technology in sections one and two of this chapter. Section three is a collation point before the continuing transformation of media encounters to interpretive responses in chapters three to five. An ethnographic representation that Pink refers to as an *ethnographic place* is reinforced in section three to reflect a comprehensive account of technologies and media as globally distributed and relocated as fragments of a multiplicity that is a media system of systems. This ethnographic place is a development of Macondo and McOndo that I name M.COM/DO to reflect the REST design pattern of interoperable technologies. It is this ethnographic place that the thesis will inhabit throughout chapters three to five.

## 2.1 A Stratification of Media Studies

This section departs from Castells and Appadurai by descending from their orbiting view of global media to the level of Kittler and Parikka who help relocate this project's attention<sup>64</sup> on global media as distributed information spaces and software. The descent continues to a *beneath* of media constructed of code and datum which is a view encouraged by Manovich and Fuller. The destination is not an underneath that privileges one over the other because this level of technology-enablement could have been introduced as a behind-the-scenes of media. The reason this level is presented as a lower level of stratification beneath media is to reverberate Bhaskar's critical realism throughout this examination of technology-enabled media. Bhaskar's contribution is a de-anthropocentric shift and suggestion that fact forms self-obscure their cognitive and non-cognitive structures. This examination of the beneath of media is guided by technology practitioners who are the informants that I have characterised as the contemporary descendants of the gypsies of Macondo. Their guidance helps decipher encounters with the particulars of constructed code and datum. The inclusion of the gypsies' perspective is an approach advocated by Manovich and Fuller as this thesis delves into the fragmented multiplicity recognised by Kittler and Parikka.

A global perspective or a view from orbit? There are numerous threads arising from Castells' work that others have drawn on, such as: the difference between location based communities and online person-to-person communities (Wellman 2001a; Wellman 2001b), temporal structuring of time in an organisation (Orlikowski & Yates 2002), corporeal travel to reinforce synchronous time and space co-presence (Urry 2003) and Escobar (2001) who provides a counterbalance to Castells' concerns for place by suggesting ways in which social movements defend place. Of interest to this project is Dodge and Kitchin's (2004) demonstration of Castells' Space of Flows and Timeless Time through a new 'code/space' assemblage of web sites, check-in security and flight decks to define practices and experiences of the simultaneously local and global. There is possibly a shared interest between these investigations and the three encounters from chapter one but Castells' viewpoint is a lofty one and difficult to broker by Dodge and Kitchin. Castells viewpoint is global.

Castells believed a new social structure was emerging at the turn of the twenty-first

---

<sup>64</sup> This shifting of attention, this *relocation* that disperses across distributed information spaces, is also shared by Corner (2000; 2002) and will be explained further in this section.

century. The three main dimensions of this new social structure are: a new technological paradigm; globalisation; the enclosing of cultural manifestations in an interactive and electronic hypertext (Castells 2000b). Castells believed a new world emerged from major historical events during the 1980s-90s producing this new social structure which he calls the network society (Castells 1996, p.6). Castells suggests the network society emerged from the historical convergence of: the Information Technology (IT) revolution that began in the 1970s; the restructuring of capitalism and statism in the 1980s; the cultural social movements of the 1960's and 1970's (Castells 1996, p.6-7). Of these societal shifts, the IT revolution is of interest to this project because I distinguish between the office automation from the 1970s and contemporary technology-enablement that needs to be taken into account. Castells' viewpoint is global but it is also historical.

Informationalism, Castells explains as "a technological paradigm that constitutes the material basis of early twenty-first century societies" (Castells 2004, p.8). Informationalism is the foundation to the network society, a new form of social organisation of human activity (Castells 2004, p.13). Here, this notion of informationalism extends to the technology-enabled media items of this project. However, care must be taken when adapting Castells' notion because his analysis began as the spatial impact of technology on cities and regions (Castells 1985, p.19; Castells 1989, p.2). Castells' conclusion was that "new technologies allow the emergence of a space of flows, substituting for a space of places, whose meaning is largely determined by their position in a network of exchanges" (Castells 1985, p.33) and that "a precise and major characteristic of the new economy is its functional articulation in the space of flows" (Castells 1989, p.351). I call that into question because Castells' informational space is described in parallel to places and so it takes similar form to the virtual space considered and disregarded in the introduction to this thesis. That once exclusively online space comparable to Castells' space of flows, now contends with the layering of spatialised information: a contemporary informationalism by way of Augmented Reality. The contemporary technology-enablement of an augmented view of reality with smartphones in our hands is vastly different to automated office work located in networked financial precincts. The contemporary relevance of Castells' implicit division between his spaces of place and flows is reduced by the spatial layering of place and information by Augmented Reality.

Castells' space of flows has arisen from his empirical analysis of economic activities, their

patterns of location, and the role of information technologies as enabler of a new organisational logic he calls the Network Enterprise (Castells 2000a, p.408; Castells 1989, p.348-349; Castells 1985, p.19). Castells contemplates:

A space of flows substituting a space of places ... [when] a hierarchy of functions and power positions structures the territory across the nation and across the world, separating functions and units of production, distribution, and management to locate each one in the most favourable area, yet articulating activities through a communication network ... [and] as the organisational logic changes often, and as the social and economic system responds to a multiplicity of large-scale organisations, we are living increasingly in a space of variable geometry where the meaning of each locale escapes to its history, culture or institutions, to be constantly redefined by an abstract network of information strategies and decisions.

(Castells 1985, p.14-15)

At this stage Castells clearly identifies the replacement of one spatial logic by another. The space of flows is a substitute for the space of places. For Castells, the space of flows is something of an emergent notion, contingent on the reformation of organisations and respective social or economic responses. This is an interesting proposition for 1985 given Castells determination of the dependency of this spatial logic on information technology because information technologies also depend on material configurations and spatial locations. Castells develops his conceptualisation of the relationship between space of flows and space of places as a substitution expressed as replacement in power. He claims:

The supersession of places by a network of information flows is a fundamental goal of the restructuring process ... because the ultimate goal of the restructuring is based on the avoidance of historically established mechanisms of social, economic, and political control by the power holding organisations.

(Castells 1989, p.349)

Thankfully Buendía is only a curious character and not paranoid. It might be a fateful combination if he was to respond to the threat proposed by Castells, the supposed threat of those power holding organisations, without first applying his reckless imagination to an inspection of contemporary technologies that enable vast populations of individuals to create and consume media. The potential of technologies can be understated and misunderstood but Buendía's civic concern and speculative attitude would recognise it just as he foresaw the inadequacy of a magic carpet as an infrastructure of transportation: the space of flows can't be an alternate reality.

Castells is unswayed by Buendía's critique. The emergence of the space of flows is a power struggle for Castells because "the emergence of the space of flows actually expresses the disarticulation of place-based societies and cultures from the organisations of power and production that continue to dominate society without submitting to its control" (Castells 1989, p.349). Castells is clear with his prognosis for the space of places, that "cities and regions disappear as socially meaningful places" (Castells 1989, p.350). This is further reinforcement that he interprets from his analysis a power struggle between space of flows and space of places. Castells is suggesting that places disappear when the space of places cedes to the space of flows. What the space of places cedes is unclear with Castells referring to the decline of place-based social meaning which is a comprehensive notion in itself and a notion I complicate by reminding of the contrast of Castells' era of information technology, that of office automation in the 1970s, and a contemporary space of flows that includes hand-held Augmented Reality enabled by mobile computing.

Castells promotes the decline of place-based social meaning as a trend and one that can be reversed, despite the irreversible logic of the space of flows, if localities find their role in the new informational economy (1989, p.350). Castells' suggestion that places disappear when the space of places is superseded by the space of flows is not a reference to metropolitan disaster scenarios. He is drawing attention to the potential impact on place based societies, populations that are vulnerable, individuals and their communities potentially affected by the global circulation of capital. The new informational economy is an asset base that can determine the dissemination of information be it for commercial, political or cultural reasons (Castells 1989, p.349). Castells is concerned for the potential cultural displacement by "cultural messages to be marketed, packaged, recorded, and beamed in and out of people's minds" (Castells 1983, p.349).

Castells' concern resonates with the trans-national experiences of McOndo where product and cultural imagery passes unrestricted between place oriented boundaries. The tension between the space of flows and space of places is expressed as more than conditions of a changing world. Castells has presented the space of flows as an unavoidable threat. What is at risk are the local culture messages possibly displaced by the global messages of those power holding organisations. Perhaps of greater threat is the saturation of cultural texts by a global and mobilised technology-enabled population: a user-base of those technologies encountered in chapter one. This is where Vionnet and Odell's creative projects (reviewed

later in section 2.2) are helpful because from such intense production and consumption of media items by a global and mobilised technology-enabled population emerge new and re-figured forms of expression.

Castells' viewpoint is useful but too distant from contemporary technologies. Castells' perspective is based on his analysis of global patterns of urbanisation congregating around financial precincts that depended upon global real-time networks and the deployment and support of office automation enabled by information technology. Those phenomena are quite simply different to the individualised ubiquity of media and technologies that interoperate asynchronously with global and public software solutions, as occurs with the Augmented Reality app Layar. Castells' phenomena still operate and are relevant but in addition it is important to consider separately mobile technologies: those personal and individualised devices and sources of information flows that contribute like upstream tributaries and converge like a turbulent river delta to the 'Flows' Castells refers to. His global view from orbit is afar. Perhaps Appadurai offers a closer view of technology-enablement.

Appadurai comments on the distributed production of place. Appadurai claims the production of the modern faces a new instability where the juxtaposition of mobilised people with electronic media impel and compel imaginations (Appadurai 1996, p.4). The instability is that viewers and images are in simultaneous circulation. I agree with his claim and can relate the instability of viewers and images to contemporary asynchronous forms of connectivity such as the example of Augmented Reality in section 1.3. In that example the transactional asynchronous exchange was between device and Panoramio image service via the Layar servers occurring concurrent but dislocated to the asynchronous exchange of visitors to that destination now aggregated together in an image collection hovering mid-air and on-screen in my hand. These multiple human and nonhuman interactions are the basis for the analogy to a turbulent river delta introduced previously as an update to Castells Flows.

A distributed production of place suggests tectonic differences within a global view of media. Appadurai adopts the suffix '-scape' as a way of indicating the fluid and irregular boundaries of the relations he is studying, as "perspectival constructs, inflected by historical, linguistic, and political situatedness of different sorts of actors" (Appadurai 1996, p.46). Appadurai's 'Scapes' are ethno, media, techno, finance and ideo. These Scapes are



his five dimensions of global cultural flows and are the building blocks of the multiple imagined worlds inhabited by persons (Appadurai 1996). Appadurai explains a contemporaneousness of competing and conflicted imaginary worlds. This is the pluralist and turbulent world that Buendía revels in and automagical thinking thrives in. Perhaps Appadurai is the step closer to the ground level this project seeks.

Appadurai's (1996) ethnoscape is a landscape of mobilised people; a shifting world of tourists, immigrants and exiles. The technoscape is a global configuration of technology that extends across national boundaries. Financescapes relate to global capital. Mediascapes and ideoscapes are similar to landscapes of images and they extend the redirection caused by Ethno, Techno and Financescapes by further refracting disjunctures (Appadurai 1996). Mediascapes involve the production and consumption of many narratives be their mode documentary, entertainment, their hardware electronic or preelectronic, or their audiences local, national or transnational (Appadurai 1996). These mediascapes provide "large and complex repertoires of images, narratives and ethnoscapescapes to viewers throughout the world" (Appadurai 1996, p.48). Ideoscapes are concatenations of images that are often directly political (Appadurai 1996, p.49). The fractured tectonics of Appadurai's Scapes are seemingly useful, seemingly relevant. However, a Scape is still too great a range. The scale of his theorising defers too readily to an abstraction of the large and complex which is a premature explanation at this stage. Appadurai echoes the sentiment of Fuguet but his Scapes are distant backdrop to the technology-enabled practices of Augmented Reality. With Flows and Scapes considered, I will continue my descent to a ground level description of technologies.

Appadurai and Castells usefully conceive of Flows and Scapes to explain dynamism and structures of an informationalised society. However, their viewpoint is too distant and instead Kittler together with Parikka offer an insight to encourage closer inspection of what might be occurring amid those Flows and Scapes. Those contemporary gypsies of Macondo also have something to say about close inspections.

Close inspection is to be expected of a thesis but those contemporary gypsies draw us closer and push us closer. They suggest there is a specificity we need to reach before we can speak of the contemporary technologies of place, the technology of Augmented Reality, on its own terms.

Usually I would speak in more specific terms about a standard or brand name or something proprietary or probably talking more specifically about a single technology in terms of its identity maybe rather than it being a generalised thing or a technology, I'd talk about it in its own terms.

(quote 18)

To meet this expectation a description of Augmented Reality technologies would include specific mention of technologies already introduced in chapter one, such as: Panoramio, Layar and iPhone. There are more specific things to be identified so that this thesis begins to speak with a specificity that demonstrates the full complement of understanding these broad collections of things deserve. A dependency of Augmented Reality is iOS Location Services, that thing turned on by a switch in the settings menu. That thing that is a 'something proprietary' is at least one level of specificity closer than merely naming an iPhone or generally speaking of Augmented Reality as Flows or an inflection within Scapes.

Kittler (1990) speaks of an array of technologies and media in a way that fragments and evaporates the assumption of culture as generated by producer and consumer processual relations. His discursive approach recognises the elements as mobilised and heaving around in an endless circulation (Kittler 1990, p.4) but evading perception because of their dematerialisation and layering within abstractions (Kittler 1995). I locate in Kittler another sense of media mobilities to complement the specificity those contemporary gypsies draw us to. Connectivity enables circulation and technologies dematerialise into layers of software, datum and configuration.

Kittler (1990) establishes an earlier preceding milestone for contemporary media and technologies than the globalisation of media and technology by Castells and Appadurai. Kittler's periodisation is broad. He contrasts the introduction of technologised forms of recording circa 1900 with the role of writing circa 1800 as they are applied to the recording of the real by sensing and inscription. Kittler reminds of the transformational differences when "technologically possible manipulations determine what in fact can become a discourse" (Kittler 1990, p.232). His sensory examples are sound and vision. His technological forms are phonograph, gramophone, camera and cinema.

Kittler's periodisation can be connected to his observations of the hardware and software of computing as a pre-emptive update of media technologies circa 2000. Kittler (1995)

recognises the extension of hardware by software to provide an unrecognizable layering of linguistic extensions:

... the implosion of hardware by an explosion of software [because] programming languages have eroded the monopoly of ordinary language and grown into a new hierarchy of their own simple operation codes whose linguistic extension is still a hardware configuration, passing through an assembler whose extension is this very opcode, up to high-level programming languages whose extension is that very assembler [and] what remains a problem is only recognizing these layers which, like modern media technologies in general, have been explicitly contrived to evade perception. We simply do not know what our writing does.

(Kittler 1995, p.148)

Programming computers with code may not seem like writing but Kittler is correct to extend his interest in discursive frames to that layer of human syntax.<sup>65</sup> After all, our informants have advised that they speak of technologies as specific things amongst themselves as they work on the layers of linguistic extension Kittler refers to. Kittler then re-situates this concern from the level of code and syntax to a cultural interest in the production and consumption of media that recasts a user-interface as representational interface:

...the general digitization of channels and information erases the differences among individual media. Sound and image, voice and text are reduced to surface effects, known to consumers as interface. Sense and the senses turn into eyewash.

(Kittler 1999, p.1)

Kittler's acerbic comment about eyewash is a reminder that the increasing exchange of socially produced media items doesn't guarantee cultural worth.<sup>66</sup> That negative framing is important to acknowledge but will be set aside. Kittler's main point to dwell on is that digital data enables translations within an endless loop (Kittler 1999, p.2) which he reinforces by reminding of writing as a prior evolutionary state of contemporary technologies and inscription evoking Goethe's remark regarding literature as "a fragment of

---

<sup>65</sup> Recall here the sociological interest in technology of this thesis as introduced in the literature review and represented by the fields of Software Studies (Fuller 2003; Fuller 2008; Manovich 2008) and the Social Construction of Technology (Latour 1999b; Latour 2005; Bijker et al. 1987).

<sup>66</sup> A connection can be made between this comment and the question raised in the literature review of an intellectual runaway that is a cultural vicious loop raised as counterpoint to the presence of *imaginaires* and reckless imaginations.

fragments" (Kittler 1999, p.6). Kittler's circa 2000 update plots the introduction of computing, marking that event as when "the world of symbolic really turned into the world of machine" (Kittler 1999, p.18). He relies on an early conception of artificial intelligence that presumed in 1937 that "a primitive mechanical brain consists of storage unit, dialing system, and simple device that can handle conditional chains of two or three links [and that] more complex brains are merely a matter of executing those operations faster" (Kittler 1999, p.275). Kittler can be extended by our informants to evoke a sense of specificity that is an intensity of fragments situated in a view of computational media as a convergence<sup>67</sup> where differences are erased by their technological translation that is fragmented and circulating within an endless loop or discourse network:

Where recursive, that is, automatizable, functions succeed classical analysis, computation works as a treadmill: through the repeated application of the same command on the series of interim results.  
(Kittler 1999, p.248)

A possible interpretation of this theorised scenario is of a deteriorating conflation. Differences erode and fragmented elements are circulated by a computational treadmill while humanity awaits the equivalent to Vinge's singularity to awaken and make sense of this scenario once their mechanical brains are capable of executing those operations faster. Instead, Kittler's recognition that digital data enables translation will reinforce the enquiry prompted by Augmented Reality regarding the interoperability of technologies and the exchange of media elements.

There remains a sense of Kittler's circulation amid notional Scapes and by way of Flows, to look back to Castells and Appadurai, but contemporary technological media, such as the layered and hand-held photo collections of Augmented Reality, is mobilised and mobilising in that it is an interoperable and reconfigurable mass of globally distributed technologies. An ally to connect Kittler with a grounded interest in the specificity of these interoperable and reconfigurable technologies as expressed by our gypsy informants can be found in Parikka. He draws on Kittler to engage with technical media culture (Parikka 2012, p.96) suggesting an analysis that is grounded in contemporary culture to reveal what he proposes as a multiplicity of materialism (Parikka 2012, p.99). The technological fragmentation suggested by Kittler and Parikka is recognisable in the specificity explained by those

---

<sup>67</sup> This view of convergence is an alternative to Jenkins' (2006) more coherent view of convergence, as: flowing content circulated by cooperative industry and migratory audiences.

contemporary gypsies. This fragmentation is recognised and inscribed. The encounters and evidential basis of this thesis are not parts that elegantly constituent a whole. Instead, the interoperable technologies that enable Augmented Reality have component fragments that exceed a singular Technology to provide and augment a multiplicity of media.

Fragments have arisen during encounters and their record as partial evidence is described in appendix 3. Still, the layering within abstractions is a vague conception because software, datum and configuration are specific when named examples are given, when Laya is referenced or geotagged datum presented, but the immaterial associates of those layered things is still unclear. We're talking about broad collections of things and it is important that we're at least not clearly demonstrating a less than full complement of understanding. The gypsies continue to explain their specificity and fragmentation:

The terminology of software engineers, it's objects, classes, it's remote procedure invocation, and capabilities based security, once again very loaded terms which have a lot of connotations behind which are used to hide that detail in a sense of combining disparate technologies.

(quote 128)

We have reached via our gypsy collaborators a level of more specificity—more than Castells' Flows, Appadurai's Scapes or Kittler's fragments—and the specificity suggests a ceaseless variety of component and procedural abstractions. This described level of specificity is closer to the multiplicity advocated by Parikka but reminiscent of his antecedent, that being, Kittler's dematerialised replacement of the production and consumption of culture with a discursive multiplicity of elements that are mobilised and heaving in an endless circulation. The discrete code-things of objects, classes and remote procedure invocation are explained as abstractions that are used to hide the detail of interoperable technologies. This deliberate encapsulation requires an interpretive interoperability to navigate the associations made in code and distributed between disparate technologies.

Kittler offers an extension of Castells and Appadurai to reach a more relevant level of detail that fits with the account of corporeal travel, photo collection and the encounter with augmented reality described in chapter one. Kittler suggests an alternative perspective to the global Flows of Castells and Scapes of Appadurai that aligns interests in and concerns

with media amid the technology-enablement described in chapter one. However, even Kittler extended by Parikka does not reach the specificity called for by the gypsies. This interest in the specificity of interoperable technology-enablers will be returned to in section 2.3 to prepare for chapters three and four.

Now, attention will shift from broad collections of media and the specificity of technology to the specificity of media. Attention will shift from an increasing level of specificity progressed from Castells to Appadurai to Kittler and Parikka, and enhanced by the dialogue with those contemporary descendants of the Macondo gypsies. Attention will shift to Corner, Lüders and Pink who reinforce this sense of entanglement of cultural elements such as photography amid the endless heaving and circulating of broad collections of media and technologies.

Corner identifies a "widespread dispersal of documentarist energies and appeals across a much larger area of audio-visual culture... signal[ing] the scale of its relocation as a set of practices, forms and functions" (Corner 2000, p.687-688; Corner 2002, p.266-267). I examine the use of internet technologies to create audio-visual documentation by individuals for sharing online. I have relocated an examination of 'documentary' to the use of textual accounts, photography and Augmented Reality (Nicholson 2011), presenting encounters with technology-enabled media as possible examples of Corner's predicted relocation of documentary within a "new ecology of the factual" (Corner 2002, p.265). This relocation of documentary to a new ecology of the factual brought about by the shifted cognitive and affective investment in audio-visual representations. It is a move that requires a reconsideration of what is meant by audio and visual representations to better establish the relevance of and opportunities for internet technologies as contemporary practices, forms and functions of documentary. The work of Lüders and Pink will be introduced later to assist with this task.

The user generated content and personal media practices commonplace in a contemporary internet experience are evidence of the dispersal Corner suggests. The user generated content of photo collections seen in Panoramio and when augmented on Atiu are like the heaving circulation invoked by Parikka via Kittler. These explanations by Corner and Kittler adequately complement Castells and Appadurai to extend their global view from orbit of earthly Flows and Scapes to a theoretical point of view that captures and explains the myriad of technology-enabled practices such as those of user-generated content.

Those technology-enabled practices could potentially reflect a shift in the nature of media items, that of Media and being mediated, as increasing and accumulating levels of media items are shared online. What is required are explanations at closer range that are nearer to the technology-enabled practices that are revising the cultural logic of the Space of Flows (after Castells) or are mobilising mediascapes (after Appadurai). I will next introduce Lüders' and Pink's identification of personal media and photographic practices as constituting place through the intersection of private narratives and public events. The shift from media abstractions to personal media is a shift that connects this stratified theorising of technology-enablement and information spaces — of Flows and Scapes — to the dispersed and heaving circulation of media items. The shift reinforces the role of layered encounters in this thesis as similar to Harrison's archaeology in and of the present which he explains as a process of assembling/reassembling (Harrison 2011, p.144) and countermeasure to contagious practices that spread media (and I add, diffuses cultural objects and practices amid indescribable technologies) like a virus through electronic mediascapes (Harrison 2010, p.332). The shift is a move to a ground-level and time-critical mediation of place.

Lüders (2008) examines the differences between mass media and personal media considering what destabilising effect the personal use of digital media technologies has on the distinction between mass and interpersonal communication. Differences Lüders identifies are: the interactive involvement required of users as both producers and receivers of messages; the type of interactive networks users are a connected part of as active and constituent nodes; audience differences compared to mass media networks of distribution; the non-institutionalised settings which individual users act as producers of digital media (Lüders 2008, p.691-693).

Lüders distinguishes between personal and mass media because of patterns of content interaction and access to production technologies that reduce the gap between amateur and professional standards. Lüders' highlighting of the significance of personal media and differences with mass media adds useful detail to Corner's relocation, to an audio-visual culture based on digital technologies, and Corner's dispersal, amongst a network of amateur individuals who create and consume each other's personal media. Lüders reinforced by Corner reminds of the creative industry that the photo collection visualised in section 1.2 and the collection of photos augmented in section 1.3 operate within. Lüders and Corner offer a counterpoint to Castells and Appadurai that is grounded in practice.

An example of the relevance of self-documenting photographic practice is also suggested by Pink's exploration of the relationship between amateur photographic practice and the constitution of place where she examines how "the personal and the public/collective are co-implicated in processes of representation" (Pink 2011a, p.92). For Pink, a place is a dynamic of intersecting movements after Massey's conceptualisation of place-as-event and Ingold's notion of place as entanglement of movement (Pink 2011a, p.93) that culminates in a meshwork<sup>68</sup> (Ingold 2008). Photographs, Pink explains, "can be very relevant in terms of how they integrate personal narratives into the constitution of a history for a public event" because of how photographs contribute to an engaging "visual-sensory-material environment" (Pink 2011a, p.98). Pink suggests amateur photographic practice becomes a collective practice that constitutes place by "self-consciously making memories that intertwine personal with public narratives and personal experience with collective identity" or by "re-constituting the past, again at an interaction between personal and family biographies and public events and collective histories" (Pink 2011a, p.100). The work of Pink complements Lüders and adds useful detail to Corners relocation and dispersal of documentary, reinforcing the potential opportunities that exist in a photo collection generated by a collective of people and shared online. Pink's co-implicated processes of representation also reminds of the social parallel to the complicated technology-enabled processes of representation. Co-implicated could be complicated.

Vionnet and Odell recognise the potential opportunities that exist in a photo collection generated by a collective of people. Their projects are mediated visitations to places and their creative results from those place-oriented creative projects demonstrate more than the reuse of digital imagery. Vionnet and Odell demonstrate in both of their projects an inhabitation of place via information spaces by their use of photo collections that have been generated by a collective of people and shared online. Their projects combine the co-implicated and complicated. Vionnet constructs an aggregate sight-line of landmarks and Odell makes virtual journeys. The next section shifts from the theories of media that inform the connection between place and information spaces to the creative projects of Vionnet and Odell. Their creative projects demonstrate a revised spatial reasoning brought about by the movement of media items between places and information spaces.

---

<sup>68</sup> As noted in section 1.2, an alternate interpretation of the informational view of Atiu could be a meshwork of sites that are an entanglement of scenes, commensurate with accounts later in this thesis from Bennett (2010) of being inextricably enmeshed in dense networks of relations or Morton's (2010) strange and infinite network.



## 2.2 A Revised Spatial Reasoning

This section introduces two counter-factual forms of spatial reasoning that rely on scene and screen. Two creative media projects demonstrate how participatory technologies for user generated content can mobilise imagery and suggest: the technological fragmentation Kittler refers to, Corner's relocation, or Parikka's multiplicity. The compositing of landmark photography by Corinne Vionnet will be introduced as an image that reveals a form of spatial reasoning. Her images produce a digital patina with each depiction of repetitive scenes thus recreating an aggregate sight-line. The virtual travel portrayed by Jenny Odell in *Travel By Approximation* will be reviewed as an example of a screen based form of spatial reasoning<sup>69</sup> that relies on symbolic formats such as a map to not only plan travel but to construct a journey.

### *Encounter VI Corinne Vionnet's Photo Opportunities*

Vionnet's image of Stonehenge<sup>70</sup> is the combination of sturdy and ruin that I imagine that landmark portrays.



Figure 17 - © Corinne Vionnet; Stonehenge, 2007, from the series Photo Opportunities

---

<sup>69</sup> In this sense, virtual travel becomes an asynchronous form of interaction that adds to or augments experiences and is not considered as a means of co-presence to substitute for corporeal travel (Urry 2002a).

<sup>70</sup> See figure 17, Vionnet (2007) or Yale & Vionnet (2012) for reproductions of the Photo Opportunities series.

I have not visited the site but proximity is not required to recognise the impact of events on physicality and scale. The cross-slab mounted onto the vertical pillar slabs has the appearance of a heavy immovable construction while the surrounding pillars shimmer and fade emitting a sense of deterioration. The texture of Vionnet's picture has a patina that reflects an accumulated history of ceremonies similar to how a shiny surface reflects secular highlights from the scene around it. The ceremonies perhaps something as everyday as repetitive visitation by photographers.

The marks and gestures caught in that patina of photographic practice deserve closer inspection. Vionnet's image of Stonehenge in figure 17 bears the marks of technology and that practice will be untangled to reveal a contemporary entanglement of site and scene (as previously suggested by Pink and Ingold) in this particular configuration of spatial reasoning. The untangling of practice can be attempted. A practice-led encounter with an accumulation of images from a personal site and scene is composited into a single entity (later in figure 18). Vionnet's photographic assemblages is explored through my own photographic variation of Law's method assemblage as I craft "arrangements and gathering of things" (Law 2004, p.143) to "generate presence" (Law 2004, p.42), or more precisely, to regenerate a photographic object from a photo collection. Receding background elements will be drawn forward. Images of place, of landmarks, are thickened to acknowledge the contribution of technology-enablement. A landmark moves as observations migrate from places to information spaces in the form of shared photo collections. This practice-led account will demonstrate the conditions of a technology-enabled form of spatial reasoning for that combination of place and information spaces.

The solidification of gaze in that mounted cross-slab draws attention to a landmark that looks back (see figure 17). The physical construction of cross-slab sat on pillars is primitive and does not selectively hold attention alone. The peripheral shimmer and foreground space set apart but connect with a point of visual attention that reinforces an external entity thus capturing and returning a singular gaze. A single wandering eye at any other time might slip over any part of Stonehenge's construction but this image of aggregated practice has a zone of nonhuman fixation that, like a humans' innate ability to capture eye contact with eye contact, captures gaze and responds back towards that shared point of view rebounding a concentration of prior eyesight as a re-figured sightline at that site of that scene.

The shimmer reveals technique. It is the shimmer that suggests this image is a result of

aggregation. There are traces of multiple images annealed by the heat of transistors. The colours of multiple photographic events are fused into a vitreous surface. Thickened images are thinned by having their subject dissolved to a mere trace as they are combined by technology and technique to form a semi-transparent layering of entanglement. Sites, scenes and things are annealed into an object by Vionnet. Those moments captured from the thickness of an event have receded into the patina of multiple durations leaving a distinctive and visible point of convergence that is a collective of all photographers' sightlines.

\* \* \* \*

How does she do it? The technique is simple enough: source similar photographs and then composite them. Except these landmarks are not montages and combining multiple images into a layered image by using software such as Adobe Photoshop to adjust transparency and set the parameters of their combination to 'soft light' or 'overlay' might not be enough to produce a similar convergence and recession of photo opportunities into a similarly unique representation of place. Layering might create a similar aesthetic but it doesn't easily transform that image of place from dispersed photo collections heaving around information spaces into an aggregated point of view that represents the presence of that place as Vionnet has. How could I do it?

Re-photography<sup>71</sup> is an unintentional habit made easier by increasing amounts of storage. Digital photography can inexpensively generate massive collections of data without any cost implication to re-photograph the same sites and scenes so as to create the same images. The price of storage doesn't encourage the re-photography of past photographs but it doesn't discourage taking multiple photos either. Excessive storage does not necessarily result in excessive behaviour but it does enable repetitive behaviour. I re-photograph a favourite personal scene not because of any interest in that moment as special but because of a personal interest in the subject and monument of the original image: that personal landmark.

A singular image is not collected. Instead, a collection is accumulating for this re-photographed scene. Acquisition is not selective. Imagery is acquired in batches. The camera shutter speed operates at similar speeds as past generations of SLR camera and it captures images as quick as light conditions at site and reflected off scene allow.

---

<sup>71</sup> Re-photography is similar to Kumar's (2014) repetitive photographing of previous scenes and not Kalin's (2013) photo of a photo in a scene.

Incalculable quantities of storage capacity encourage increased amounts of photography. The collecting images of site and scene adjust as storage increases. I have accumulated images of my wife posing on the courthouse steps for each of our eight trips to the island of Rarotonga in the South Pacific. Having sourced these images from a personal collection I can attempt the next step of compositing them and my (mediocre) outcome is presented in figure 18.

Figure 18 - Constructing a Re-photographed Landmark

The main challenge was encountered during the first few images. The challenge was a matter of alignment and scale. How to combine photos that are each taken with the lens set at varying focal lengths into a single visual item that is not a cacophony of maligned features, over-saturated colours and burnt out details? Simply layering images on top of each other and adjusting transparency soon reveals that there is more to the images of Vionnet than an inverted representation of the photographer's point of view.



Parameters of technology had to be overcome; the focal length had to be compensated for. The focal length is an optical substitute of human vision that occurs within a site and is directed at a scene.<sup>72</sup> Technology can substitute for human involvement and that is a premise for automation. Perhaps 'substitute' is the wrong qualifier for this occasion. An additional qualifier would be helpful for all those occasions when a person is operating the camera, actively seeing, their eyesight travelling around the site as they inspect multiple possible scenes with their gaze, their peripheral view greater than the widest of camera angles and the resolving power of their visual cognition exceeding the ability of a telephoto lens to zoom in and closely frame a distant element in an open-air scene. An additional qualifier for 'focal length' could be augmentation. For this occasion, which has now become a subsidiary use-case within what is becoming an expansive scenario of technology enablement, focal length is an augmentation that binds sight with duration. Equally, technology can enable human involvement and that is a premise for entanglement explored later in this thesis.

---

<sup>72</sup> See Nicholson (2010) for an examination of focal length mediating sites and scenes.

Human vision far exceeds the optical capability of a camera lens. Focal length neither substitutes nor amplifies the vision of a present and active photographer. It would substitute in the case of an absent photographer but that is akin to surveillance and less like photography. This use-case can be stated as focal length rendering a scene at a site for an arrested moment that would otherwise pass noticed but quickly surpassed by subsequent moments. The term 'surpassed' has been chosen specifically for its dual meaning to reinforce moments that go beyond each prior moment and the inability of human cognition to retain discrete visual moments like a photo can. Focal length augments duration because the focal length of a lens frames a scene that would otherwise blur within an imprecise sequence of momentary visions. Focal length isolates scenes within a site-specific gaze.

Vionnet's image demonstrates an internal refraction to each scene that is caused by a variety of focal lengths. The shimmer is caused by a coalescing of varying focal lengths into a single focal point. This was all too apparent as I combined my own set of images and realised that the variety of scales of foreground subject determined a trajectory back to the photographer that was not determined by distance or bearing but instead was determined by the mechanical and optical parameter of focal length. Vionnet solves this disjuncture by receding foreground subject details, withdrawing them from the site, and altering the durational moment to become a revised spatial reasoning between landmark and photographer's point of view. Vionnet has created a scene of distinctive image qualities that respond to our gaze and has reconstructed the site that positions the viewer alongside multiple photographers as the landmark emerges at a distance from the multiple sightlines re-rendered in her aggregate image.

This singular concern for focal length is at the expense of the argument being developed around the entanglement of human and nonhuman configurable entities. The point has been made about the relevance of technology-enabled spatial reasoning with the above example of Vionnet's composite landmarks and my personal exploration of technique to reveal the role of focal length as just one entanglement, one more *thing* that combines with site and scene. If equipped with a precise view of specificity amongst the broad collections of things then media systems of systems (such as digital cameras, storage cards and online photo services) could be demonstrated to reveal the elaborate tributaries of site, scene and thing. However, the complete range and detail of those multiplicities and technology fragments exceed the scope of this project. Instead, a brief but focused excursion into the relationship between focal length and aperture will be introduced to reinforce the previous

interpretations of entanglement between technology, photographer and their practice as is evident in the work of Vionnet.

Focal length also combines with aperture to create a selective focus within a scene. Depth of field is controlled by a combination of lens focal length and aperture. Depth of field is a visual expression of an optical configuration. This configuration has been a stable combination of camera and lens parameters but now the domain of computing is reaching beyond component parts like storage cards and CMOS sensors to a different method of recording the visual as data.

The Lytro camera system (Ars Technica 2011b; Lytro Inc. no date) captures a scene as data not an image of that scene stored as a visual picture. The Lytro camera is a sensor that captures light properties and stores those as the basis for image reproduction. This is different to rendering a visual image and storing that image as a file. Instead, the Lytro camera system transforms a digital image into a dataset. The data can be recalculated to render different visions of that framed scene after the photographic event thus extending the duration of that photographic event forever into the future as subsequent moments are isolated by selective focus on elements within the scene. Selective focus can be changed after the photographic moment thereby altering the optical properties that have governed an image since the initial methods of photography rendered a scene as stasis by chemical reaction between light and emulsion.

This datum alternative to scene capture could mark a different computed regime of photography that revises the history of digital photography to a transitional period during the later stages of an era of recorded image. Technology adoption can also be fickle. There operates a milieu of patents<sup>73</sup> and market forces<sup>74</sup> exerting pressures that tangle technology-enablement, and so an equal alternative could be the Lytro system merely becomes a footnoted aside within a history of continuing photographic practice. Regardless of the adoption and impact of the technologies of the Lytro camera system, Vionnet's Photo Opportunities and the flexible momentariness of the Lytro camera has demonstrated a reconfiguration of site and scene that shifts visual expression from technology-

---

<sup>73</sup> There are numerous intricacies that correlate to code libraries whereby patents assume a role as industry scaffolding (Ars Technica 2011a), are prone to self-interested parties exploiting overlapping patent ownership (Slashdot 2011b) which results in a complexity of patent thickets (Ars Technica 2011c).

<sup>74</sup> Here Winston's (1998) supervening social necessity may suggest what lies ahead for the Lytro camera system as it strives for acceptance despite the supervening necessity being overshadowed by ubiquitous camera technologies diffused by convergence of camera and smartphone.

enablement to an entanglement of media and technologies with places of interest whereby the trajectory of an image suggests the transformation of visual to datum.

Another form of spatial reasoning has occurred as a result of these photo collections heaving and circulating, dispersed by online sharing. Let's join Jenny: on the road and hungry on her virtual road trip. With input from Latour, the technology-enabled journey of Odell is untangled to identify components of spaces that reconstruct everyday scenes as mobilised information spaces and places. The role of Latour is to help extend the network of interactions present in Odell's narrative to reveal the expansive materiality of virtual travel.

*Encounter VII Jenny Odell's Travel By Approximation*

Odell planned her journey and made it. She explains "I transported myself into one place after another, both by writing a travel narrative and by using Photoshop to integrate myself into photos I found online" (Odell 2010c). Her journey begins with a road-trip she planned to take; is enabled by online information sources such as Google Maps and Panoramio; was constrained by travelling feasible distances in a single day and staying where accommodation was provided (Odell 2010c; Odell 2010d). Odell's virtual road-trip demonstrates many characteristics of travel but her navigation of information spaces is vastly different to the corporeal travel of section 1.1.

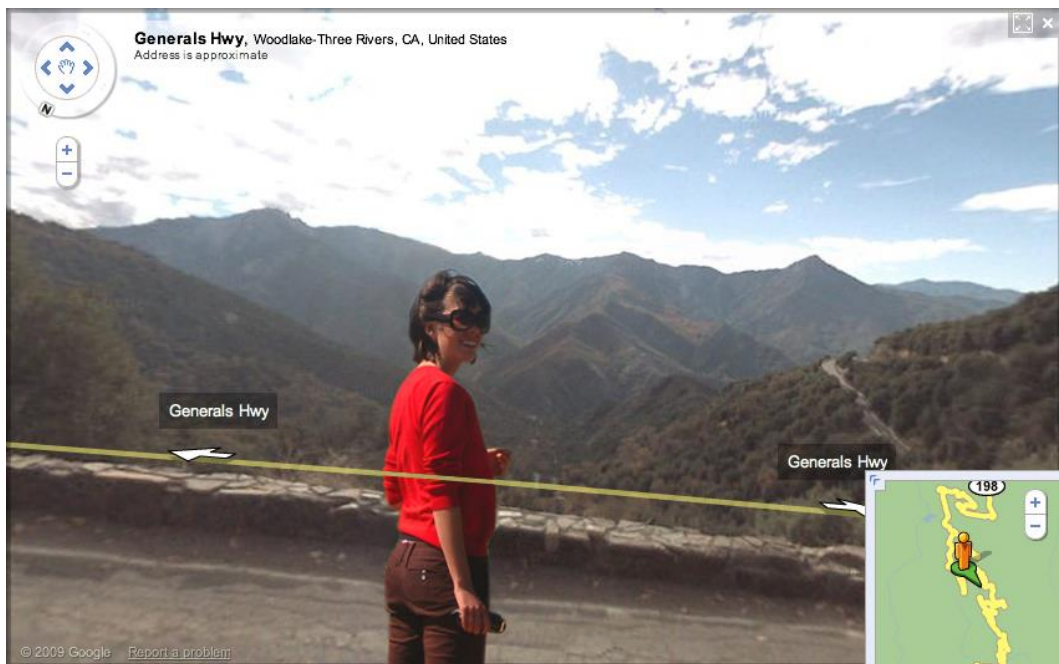
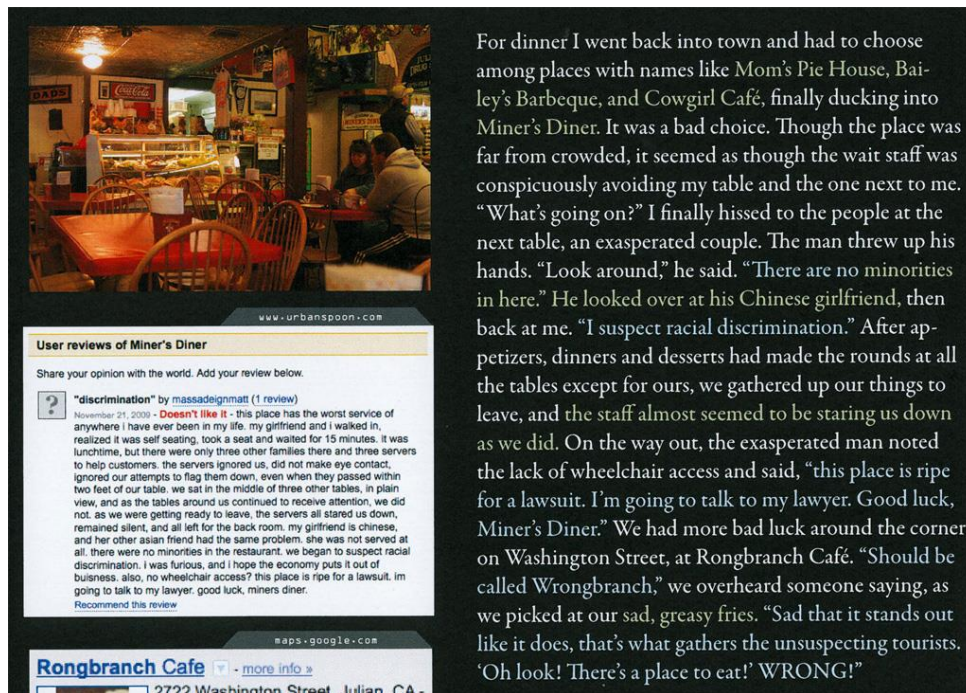


Figure 19 - Photoshop Integration at Sequoia National Park

Odell successfully blurs the distinction between 'taking' and 'making' a road-trip. Perhaps her Photoshop integration at Sequoia National Park (Odell 2010b) demonstrated in figure 19 could be dismissed as merely photo manipulation if it wasn't for her spatial wandering to navigate the information spaces and interact with fellow travellers like she did at the Grand Canyon on day 24 (Odell 2010a). Her *making* of the journey by finding online narratives and then her creative Photoshop integration into those places resulted in a deeply personal travel narrative. Her making of the journey resulted in her taking the journey: a journey she explains as "neither real nor unreal [and] somewhere in the space between pixels and imagination" (Odell 2010c).

Jenny needed to eat. One of the conditions of her virtual travel was that her plans needed to be feasible and so Jenny needed to find places to eat. Jenny reported her experience at The Joint on day forty-nine, which "turned out not only to be lucky, but also the final blow to my already-failing vegetarianism" (Odell 2010c). Her narrative is more than a simulated route. Jenny's self-documentation captures her efforts to nourish herself within the constraints of technology, available information and vegetarianism. Jenny's reliance on online reviews to guide her dining choices established her as one of many actants in a series of interconnected nodes. What additional materialities would Latour reveal if he were to explain Travel By Approximation as a fully reversible network of actants?



For dinner I went back into town and had to choose among places with names like Mom's Pie House, Bailey's Barbeque, and Cowgirl Café, finally ducking into Miner's Diner. It was a bad choice. Though the place was far from crowded, it seemed as though the wait staff was conspicuously avoiding my table and the one next to me. "What's going on?" I finally hissed to the people at the next table, an exasperated couple. The man threw up his hands. "Look around," he said. "There are no minorities in here." He looked over at his Chinese girlfriend, then back at me. "I suspect racial discrimination." After appetizers, dinners and desserts had made the rounds at all the tables except for ours, we gathered up our things to leave, and the staff almost seemed to be staring us down as we did. On the way out, the exasperated man noted the lack of wheelchair access and said, "this place is ripe for a lawsuit. I'm going to talk to my lawyer. Good luck, Miner's Diner." We had more bad luck around the corner on Washington Street, at Rongbranch Café. "Should be called Wrongbranch," we overheard someone saying, as we picked at our sad, greasy fries. "Sad that it stands out like it does, that's what gathers the unsuspecting tourists. 'Oh look! There's a place to eat!' WRONG!"

Figure 20 - Jenny Dines at Miners Diner



Jenny would often eat at an eatery where a table setting would be ready and inviting. A network, for Latour, is a substance transformed from mere object to a reversible thing with everything it needs to subsist "through a complex ecology of tributaries, allies, accomplices, and helpers" (Latour 2011, p.4). A table setting is a node of accomplices and helpers in Jenny's networked experience: a table to be seated at by her host with cutlery set out. At the end of service, a table is typically cleared to reveal the furniture. The reversible thing is a table setting that is transformed back to its constituent objects when knife and fork are removed from the table. As a self-documented account of feasible travel, *Travel By Approximation* became a dining journey as Jenny moved from table setting to table setting and from town to town. The table setting created a space for her social encounters as becomes evident when Jenny narrates a user review of Miners Diner (presented above as figure 20) from *urbanspoon.com* on day six of her travel:

Though the place was far from crowded, it seemed as though the wait staff was conspicuously avoiding my table and the one next to me. "What's going on?" I finally hissed to the people at the next table, an exasperated couple.  
(Odell, 2010c)

One of the couple was the user 'massadeignmatt' who posted 'discrimination' on November 21 2009. He described his experiences being ignored by serving staff despite trying to flag them down when they passed within two feet of the table where he and his Chinese girlfriend were seated.

The above analysis has attempted to isolate network nodes as a demonstration of the complicated scene that Jenny constructs. At *urbanspoon.com* the complicated node was an inviting table setting with its furniture, cutlery, menu and service. This analysis revealed a recurring site amid informational locations. These are sites for encounters between Jenny and participants who were co-opted by their association to the information sources Jenny relied on for her virtual travel. Latour's expansive materiality that is inclusive of information, objects, interactions and things has isolated a recurring narrated space, the table setting, as an intimate spatial arrangement that sustained the journey and created a shared sense of place.

It was there at that scene that the revised spatial reasoning of Odell was made apparent. Her review of information sources transformed from a navigation of place via information spaces to a form of virtual travel. Virtual travel is a stationary form of tourism whereby the

spectator is immobile<sup>75</sup> and fleetingly observes an on-screen experience of imagery similar to the view framed by the window of a moving vehicle (Gibson 2006). Odell's dining scene reveals how the technology-enablement of narratives create a revised experiential that never was a direct experience. The site and scene has been left intact but analysed to reveal material and immaterial componentry left in its complicated situ such as cutlery, menu and username. The traveller in Odell's form of virtual travel is provided more means to interact with elements of those sites whereas Gibson's virtual traveller is only a spectator to passing scenes: a fleeting observer. Odell's form of virtual travel reinforces how the technology-enablement of mobility encourages a tangle of interactions as did the thickened accounts of corporeal travel in section 1.1 or the encounter with Augmented Reality in Atiu from section 1.3.

I consider Travel By Approximation an example of factual media that fits with Corner's suggested relocation of documentary and an example that tests the challenging distinction between factual and fictionalised journeys. The historical association between the travelogue and documentary (Grierson 1966, p. 207) is expanded to include contemporary technologies that capture and transport our gaze to remote locations. The screen of Jenny Odell's virtual travel is a computer screen and her remote view is framed by a web browser. She encounters dispersed photo collections and other media items that heave and circulate amid the Flows and Scapes of Castells and Appadurai.

\* \* \* \*

The projects of Vionnet and Odell present particular forms of spatiality that emerge from technology-enabled image and interaction. Their projects demonstrate a revised spatial reasoning as can be achieved by technology-enablement. Their revised spatial reasoning, that of reconstructed aggregate sight-lines and interactive virtual travel, are alternative views of the same media items that appear in an Augmented Reality layer, such as the Panoramio layer of photo collections. What their projects conceal are the things of their construction. The *things* that construct those revised spatialities.

There are different ways of engaging with things. There is Appadurai's interest in the things themselves as "congealed moments in a longer social trajectory" (Appadurai 2006, p.15) and Brown's survey to provoke a rethinking of media things reminding that "each [media] in

---

<sup>75</sup> Contrast this form of immobility to that of section 1.2 where the image was immobilised when the GPS signal was lost or section 1.3 when I was tethered to WIFI to experience Augmented Reality in Atiu.

its way newly mediates the relation between people and objects" (Brown 2001, p.16). However, those perspectives could equally be an interest in the mute things of scenes such as the cutlery in Odell's virtual dining experience and not strictly an interest in those things that revise and construct spatialities such as the things that are parts of camera or photo systems.

Instead of the things of scenes I will seek out those active things that construct. Daston (2007) offers an insight into those things. Daston speaks of the power of things to gather (Daston 2007, p.16) and simultaneously be material and meaningful; that matter constrains meaning and vice versa; that construction plays a role in construal (Daston 2007, p.17). Except, the threat of Buendía, his reckless imagination, is never far and care must be taken to not just follow Daston & Park's lead and marvel at the objects and things (Daston & Park 2001). Marvel quickly converts to Automagic because it can be a construct of self-deception that is an epistemological escape to evade explanation in favour of a socially agreed sense of wonder.

Bennett (2010) also speaks of the power of things to gather and simultaneously be material and meaningful. Her example of items gathered on a street grate is an accessible case-study to delve into, to get beneath of, to try and reach the items and things, those *things*, that are an extension of: photo collections, place visiting, and information space consumption within layers of technology-enablement. Bennett encourages a pursuit of specificity as manifests in those things that gather in reformulated meanings and material formations. Chapter three will continue this focus on those things that revise and construct spatialities. Chapter three extends this interest in things with a closer examination in section 3.1 of the things found on Bennett's street grate.

The next section will complete this chapter's situating of media items (such as a place-oriented photo collection) by extending, perhaps over-extending, a disciplinary interest of media in technology-enablement. The deliberate over-extending allows for a study of media technology to give way to the more complicated study of media systems that, when globalised as Castells and Appadurai pre-empt, also becomes something more complex: a media system of systems.<sup>76</sup> The site of this particular system of systems is a place I name m.com/do.

---

<sup>76</sup> System of Systems (Firesmith, 2010) is extension to Wardrip-Fruin's Media Systems interpreting computational processes as part of culture (Wardrip-Fruin 2012; Wardrip-Fruin 2013).

### 2.3 The Ethnographic Place of M.COM/DO

A number of episodic encounters have been introduced. Those episodes were the corporeal travel in section 1.1, the informational view of a photo collection that was presented as an example of digital gaze in section 1.2, the augmenting of Atiu in section 1.3, the creative projects of Odell and Vionnet that aggregated media in section 2.2. This section marks a point of transformation when individual encounters presented so far as episodes within a broader narrative seize within and from each other a discursivity that travels as through-line in and between them. I locate the episodes so far within the sites and scenes of m.com/do and I explain the interpretive interoperability I will continue to seek through chapters three and four to establish in chapter five a *fluid inter-operability* that can be deployed as a form of critical interpretation befitting the technological place of connected technology-enabled practices. The transformation achieved by this section becomes something more particular than an analytical assemblage. The transformation is the formation of an account with a verisimilitude, not resemblance, to connected technology-enabled practice of photo collections as they appear in Augmented Reality. This account is based in m.com/do which is an ethnographic place to locate episodes amongst the complexity of technology-enabled practice.

Here, Barad and Pink prove helpful with their notions of intra-action<sup>77</sup> (Barad 2007) and ethnographic place (Pink 2009; Pink 2008; Pink 2013). Barad and Pink inform a previously stated form of Researcher self identification amid a larger membership of people and their things that I referred to as a "challenge of self-immersion" because of the "ubiquity of technologies be they camera or internet or mobile device, [that] establishes a common environment of technique and a sense of membership in a community: a user or practitioner community" (Fleming & Nicholson, 2013). The transformation owes much to Pink's expectation of the Ethnographer to interweave "theory, experience, reflection, discourse, memory and imagination ... [into] meanings [that] are constituted in relation to readers and audiences through *their* participation" (Pink 2009, p.42). The counterfactual location of m.com/do will act as a vehicle for a similar approach that I revisit throughout chapters three to five to intentionally, as Pink recommends, pull together the "unique configuration of trajectories" (Pink 2009, p.42) to create an ethnographic place that I am attuned to and constitute (Pink 2008, p.176) which is a configuration of: visualisation of

---

<sup>77</sup> Barad's intra-action of humans and nonhumans is examined later in section 4.1.

corporeal travel; photo collections that transform *image* to a non-representational *imagery* by way of an embedded data-set. This place is the connected and interoperable layering of sites, scenes and things by augmentation. The trajectories established by the encounters so far are: corporeal and informational im/mobilities; the transformation of *Image* to *Data*. These trajectories are beginnings for a reformulated materialism that provides for explanatory accounts of the indescribable. The interweaving of these trajectories begin to shape and establish the first proposition for the interpretive framework to disentangle media technologies.

It is here in m.com/do that proposition one emerges from the interweaving of trajectories. Those trajectories are revealed in the examples of technology-enablement provided in chapter one and section 2.2. A vocabulary has been provided by the informants, those contemporary gypsies of m.com/do, to enable access to a realm of specificity that is the constructing basis for those examples of technology-enablement. The descent by way of scaffolding in this chapter, from global perspectives of Castells and Appadurai to Parikka via Kittler in section 2.1, has reached an alternative level for engaging with the vastly distributed and indescribably complex global examples of technology-enabled media. The examples of revised spatial reasoning produced by Vionnet and Odell reinforce the potential to reconfigure an image collection into new creative aggregates thus reinforcing (together with the example of the Lytro camera system) the trajectory of image to data.

An interpretive framework is beginning to develop by downward scaffolding through these examples guided by theorists and informants. The first downward movement is from that of global systems to a perspective of a media ecology that is an interoperating system of systems. The first proposition is established from this standpoint of interoperating system of systems and in dialogue with those contemporary gypsies:

How they connect or combine, so there's kind of these, there's the buzzwords which, as much as we all kind of loath them, they are quite useful as descriptive things because they become these wonderful nouns that actually hide so much complexity, so you can say SOAP, REST and Web Services, and Service Oriented Architectures.

(quote 123)

M.COM/DO is established as an ethnographic place that is a location of interoperable

specificity. The founding of m.com/do marks the establishment of proposition one:

**Media representations are transformed by technology-enablement to a realm of specificity that is a stratified and expansive construction of exchangeable data.**

The location of m.com/do is real and imagined. The location of m.com/do has already been introduced as a progression from the fictional narratives of Marquez and Fuguet to a contemporary space and time of informationalised life. Marquez and Fuguet create a trajectory of civic development with their locations and narratives of the preternatural beginnings of Macondo and the transnational McOndo. There are tales of technology to be found in their fictional narratives that are useful accounts of imagination and mobility. As explained in the introduction, m.com/do is as non-real as the locations of Macondo and McOndo because of domain registration policies for '.com' addresses that prevent the registering of a single character address of 'm'. This location is being cast as a counter-factual place because its only claim to fiction is a mere technicality and not a technological technicality but a policy technicality. The Domain Name System accommodates single character domains but the Domain Name Registrar for the .com namespace will not. The claim to counter-factuality (instead of fiction) of m.com/do is that there is no reason this can't be constructed from the technological parts that exist and so construct I will, with the help of Buendía who was a founding citizen of Macondo.

Buendía is alerted to a visiting apparition who has a timely reminder of his spectral presence in m.com/do. A distant twice removed cousin, perhaps by a line of adopted kin that forever lived in corporeal form in a far French province leaving only twice, once during their lifetime and the other occasion was at the end of it as a departed soul to reunite with Buendía as ghostly guardian of his reckless imagination. Deleuze reminds Buendía by way of a haunting remark that resonates through time and spaces of Macondo and McOndo to reach m.com/do:

While it is thought which must explore the virtual down to the ground of its repetitions, it is the imagination which must grasp the process of actualisation from the point of view of these echoes or reprises. It is imagination which crosses domains, orders and levels, knocking down the partitions coextensive with the world.

(Deleuze 2004, p.273)

The counter-factuality of m.com/do is founded on an uneasy tension between realisms and *imaginaires* that may be as real a possibility as any actuality. Possibilities that await re-figuring from the re-configurable spectrum of technologies. And it is for imagination, but not reckless imagination, to grasp the process of actualisation converting technical possibilities into actual interoperability and rejecting impossibilities.

I construct this counter-factual account of an ethnographic place in accordance with Pink's recommendation that ethnographers combine the trajectories of theory, experience and reflection into a unique configuration that is an ethnographic place for audience and reader participation (Pink 2009, p.41-2; Pink 2013). The counter-factual account of m.com/do established here as an ethnographic place has been constructed from a parthood of possibilities by exploiting with ethnographic imagination an observation that reinforces proposition one: that technologies are implicitly detailed and interoperable. That is what the gypsies told us when explaining the role of their wonderful nouns (e.g. SOAP, REST, etc.) to hide so much complexity.

Now to return to the material gathered via encounters and presented so far. The thesis will continue to present episodic encounters re-figured in relation to this ethnographic place to locate propositions one to three and to contribute to the development of the interpretive framework which is the 'fluid inter-operability' sought by this project.

From the items gathered it is possible to see, trace and recognise the routes offered and connections made by my brand of ethnographic method that is 'to gather and use' as I interpret and analyse items of technology-enablement. You could repeat each episodic encounter but the continuity in this thesis is achieved by the configuration of this project and the contemporary parameters of its occurrence. This examination of Augmented Reality is an outcome of an ethnographic approach indebted to Clifford, Pink, those contemporary gypsies who are fluent translators of interoperable technologies, and twenty years of professional experiences in what has become the counterfactual place of automagic: m.com/do. Recognise the connections as I parse for traces of 'possible' or 'actual' technology-enablement barely separated by a flimsy divide that is a realm for imaginations.<sup>78</sup> Begin to sense the ever present threat of Buendía's reckless imagination as another imagination, my ethnographer's place-making imagination, grasps and re-figures

---

<sup>78</sup> Recall the haunting remark in this section by Deleuze regarding the role of imagination to cross domains and grasp the process of actualisation.

the extended and entangled im/materialities of a fairly broad collection of interoperable technologies. Inspect those things — the *things* — that augment a human with nonhuman to reconfigure our relation to things by way of the different gathering powers of media technologies that are: massive and distributed photo collections, mobile computing and Augmented Reality software. The justification for m.com/do has been provided and now its formative period will be introduced.

The town of Macondo was arranged around sun and water. The many houses of Macondo are located with the forethought of Buendía so that all would enjoy the same privileges of access to water and sun as each other (Marquez 2009). As a town planner, Buendía is a role model for the orderly co-existence and interoperability amongst inhabitants that Fielding establishes for m.com/do with his proposal for a REST design pattern (Fielding 2000; Fielding & Taylor 2002). The REST pattern proposed by Fielding is an imprint that overlays the predominant and stateless Hypertext Transfer Protocol (HTTP) protocol.<sup>79</sup> The REST pattern transforms location and addressing schemes from inert client-server request and send relationships to an activated exchange between multiple parties that initiate action amongst each other thus interoperating.

As the gypsies explained, so much complexity of connections and combinations, that interoperability, is hidden by wonderful nouns like SOAP, REST, Web Services and Service Oriented Architectures. These are some of the things that construct. The REST design pattern transforms those things within a discursive frame that weaves through stratified layers of media and technology. That stratification has been introduced so far as: new ecologies of the factual; tectonic Scape building blocks of multiple imagined worlds; upstream tributaries that converge like a delta to form global Flows; multiplicities of photo collections that are transformed by interoperating technologies to be re-figured as the revised spatial reasoning demonstrated by Vionnet and Odell.

The place of m.com/do is an ethnographic representation to visit and return to throughout this thesis as hidden encapsulated im/materialisms are revealed by analysis and with an interpretive interoperability. The thesis navigates the precincts of media, software and device that divide m.com/do by moving between evidential sources that are image, code and datum. The ethnographic place of m.com/do is a site for interactive forms of

---

<sup>79</sup> Fielding was also contributor to both proposals for HTTP 1.0 and HTTP 1.1 protocols (Internet Engineering Task Force 1996; Internet Engineering Task Force 1999).



participant observation or the 'gathering and using' of augmenting media and technologies. These researcher interactions occur amid broader collections of specific things — within Flows, Scapes and fragmented multiplicities — that I refer to as a media system of systems.

This is a crucial point for the thesis: acknowledging an immersion into specificity as the encounters and examples, those experiences and associates of Augmented Reality, reveal their expansive construction. This transformative point is a twist motivated by the interest in code and software advocated by Kittler, Parikka, Fuller and Manovich. The twist is influenced by Tarde via Latour (Latour & Lepinay 2009) because it is a descent into detail to reveal abstractions. This twist is encouraged by the materialisms of Latour and Bennett with their (and my extension of Bhaskar's) de-anthropocentrism by way of an interest in the nonhuman amid a complexity of technology-enabled realisms. This twist is driven by this project's brand of ethnographic imagination that seeks a fluid inter-operating with and between technology-enabled examples just as they interoperate in their activated situ.

This suggestion of a fluid inter-operating foreshadows the destination in chapter five of this thesis. A framework for reinterpreting technology-enablement is developing now that the expansive specificity of proposition one has been revealed. The destination is an enacting of that framework to demonstrate a critical form of engagement with contemporary technology-enabled sites such as this location of [m.com/do](http://m.com/do).

Chapter one introduced encounters with place and information spaces that demonstrated the successive spatialities of: corporeal travel, a geotagged photo collection and the use of Augmented Reality on Atiu. Chapter two has considered a reconfiguration of Media to better relate to these technology-enabled spatialities by situating them amid a media system of systems.

The reconfiguration of Media began scaffolding down from Castells' and Appadurai's global view of Flows and Scapes in search of a ground-level view that resembled the items of this study, those things encountered in the three spatialities of chapter one. This downward scaffolding was complemented by the revised spatial reasoning of Odell's Virtual Travel and Vionnet's aggregated photographer's point-of-view. A 'specificity' has been revealed as a quality that operates at levels below that of broad technology-enablement of device and software. This view beneath technology-enablement is encouraged by the insights of informants, those contemporary descendants of the Macondo gypsies, who explain technology as a broad collection that is a complex suite of things.

Section 2.3 has completed this chapter by situating the accounts of those informants and the examples of revised spatialities within a study of technology-enablement as a complex phenomenon of interoperable technologies and media: a media system of systems. Technology-enablement has been revealed as expansive and tangled. The consideration of a single Technology has been superseded by the study of enabling technologies that interoperate as systems of systems. The ethnographic place of this study is [m.com/do](http://m.com/do).

Next, chapter three will continue to unpack and explain the material and immaterial components of Augmented Reality as the technology-enablement of indescribable and distributed digital splaces.



## Chapter 3. An Indescribable Distributed Materialism

This chapter explains technology-enablement as an indescribable and distributed materialism. Additional technology-enabled encounters with place are introduced as evidence of the multiplicity of technologies that combine to form a media system of systems as was suggested in chapter two. The dialogue with our contemporary gypsies intensifies with our discourse coded and analysed then assimilated back into this chapter.

The internet technologies examined by this project retain their status as a substantial human construction. The phrase 'substantial human construction' is used here to summarise the scale and synthetic nature of the constructions the informants, those contemporary gypsies, have a role in constructing. The informants explain the Internet technologies that enable the use-case of hand-held photo collections on an Augmented Reality layer. They describe those technologies as:

... some advanced constructs so things that people make, to do something-to suit some role (quote 1)

... is most often used with advanced things that appear to be, I was going to say technological but, appear to be complicated or complex (quote 9)

... essentially human creations that automate or make work easier or make tasks easier (quote 44)

... all these things that, despite all these things being quite ubiquitous, have this very very huge degree of complexity behind them, kind of motivating them or enabling them (quote 85)

From this dialogue between informants, those gypsies, the first analytical insight to proposition two is established:

**The human construction of Technology is an advanced construct that is complicated or complex.**

Sections 3.1 and 3.2 inspect technology enablers of Augmented Reality, the advanced constructs of this thesis, leading to the second analytical insight of proposition two in section 3.3: a distinction between complication and complexity.

Bennett, Mattern and Latour guide the examination of a 'beneath' amid the global Flows and Scapes, as introduced in chapter two, that arise from network connectivity to circulate and heave dispersed media items such as those items from the travel experiences, photo collection and layered elements of Augmented Reality in chapter one. Bennett, Mattern and Latour provide theoretical access to the advanced construct that is Augmented Reality. Bennett, Mattern then Latour each prompt us in the following sections of this chapter towards a reformulated materialism that might better account for this entanglement of technologies between place and information spaces.

Again a dialogue is entered into with informants in section 3.3, with those contemporary gypsies, to seek their advice on what these things are. From the dialogue with informants emerge explanations of those material and immaterial constructions that offer a starting point for a vocabulary that may parse the indescribable technology-entanglement of place and information spaces into complicated or complex collectives of human and nonhuman things.

The first section of this chapter begins with Bennett and her vital materialism of things.

### **3.1 A Subterranean View of M.COM/DO**

Bennett's account of materiality attempts to name the moment of independence from subjectivity when things combine and affect other bodies (Bennett 2010b, p.3-4). Her attempt to isolate that moment does so in a way that reveals how everyday encounters of our contemporary world of things can become encounters with cultural sites that have the power to enchant and temporarily suspend chronological time and bodily movement (Bennett 2001).

Bennett's notion of thing-power and her interest in the re-enchantment of contemporary life relocate a traditional spatio-temporal practice of fieldwork to the spatio-temporal configuration of things. Bennett's tales of vitality are concerned with the material, whereas the sketches and tales of this thesis combine the immaterial of information spaces and place with the material of technologies and space. That combination of immaterial and material further disperses the co-location of spatio-temporal configurations of things within a remote yet connected network society of Scapes or Flows that circulate a multiplicity of media amid media systems.

Bennett's account of materiality as expressed by her tale of rat, pollen and glove will be reviewed first. Second, by immersion in Bennett's scene via Google Street View, a comparative account of im/materiality will be established as a contemporary account of spatio-temporal things.

The passengers on flight NZ46 who were listening to and watching the on-board media were disrupted by a mere acronym. That figurative illustration from section 1.1 was a helpful demonstration that objects such as a distribution of screens in seats when combined with informational things like an acronym can capture attention. This illustration is also a reminder of what occurs beyond that moment within the cabin of that plane. That moment has been intrusively shaped by technology-enabled disruption when minds were alike: called to attention then diffused back amongst the many individuals and the things around us. The weather on arrival is a typical announcement; a measurement and qualifying statement usually given as "a balmy 25 degrees on the ground". A simple enough prompt with the invocative power to spawn imaginative intersections between destination and the sparse PA announcement. Does 25 degrees warrant a change of clothing and could 'balmy' evoke a South Seas climate as visually as Malinowski's description evokes a South Seas scene? Does it matter that the South Seas do not exist?

Bennett encourages the isolation of imaginative realms that potentially intersect with things. Bennett's aim is to:

...spotlight sites of enchantment in order to intensify the experience of them and thus perhaps to erode the belief that an undesigned universe calls above all for a cold-eyed instrumentalism ... [instead] with an eye toward the marvellous... [and] cohabit[ing] with secular freedom, rationality, alienation, anomie, and political system.  
(Bennett 2001, p.34)

Bennett disputes the prevalent ontological cynicism of disenchantment to instead ask "what if the contemporary world is not disenchanted?" (Bennett 2001, p.34). Entering the suggestively calculable space of intersecting imaginations is an attempt to escape human-centric subjectivities. These imaginative realms are not an interior human realm. These imaginations are exterior to our human selves and inclusive of the many objects, things and environs around us. Or to invert that statement: the many objects, things and environs that our human selves congregate with inclusive of the enchanted and fuelled by reckless imaginations.

In slight contrast, I attend to digital splaces as alternative and tangled sites of technologies similar to Bennett's attention to enchanted sites. The digital splace I am attuned to is the interoperable location I have named m.com/do. However, care must be taken to avoid an indulgent form of enchantment for fear of Buendía's reckless imagination. A reckless imagination is an indulgence prone to magical realist acceptance of automagic that may intensify the believable encounter with place and information spaces but at the expense of eroding the comprehension of information spaces as a constructed world. The motivation for keeping enchantment in check and Buendía's reckless imagination at bay is to preserve a critical mindfulness for those occasions when technologies call for a cold-eyed instrumentalism that can decipher the interoperability of things and humans amid substantial human constructions.

Bennett refers to a variety of narrative forms as she introduces her account of materiality. She introduces the things she observes as characters that interact in a speculative onto-story to highlight the overlap between human and nonhuman things (Bennett 2010b, pp.3-4). Her story is designed to communicate a moral that she explicitly states in her introduction. One moral of her story is that humans are but one member of a complicated web of nonhuman elements and things that surround and infuse us (Bennett 2010b, p.4). For such an ambitious lesson, the story is quite a simple one. It's barely a tale. It is more akin to an encounter although something greater than a mere observation. The encounter was a "nameless awareness" heightened by Bennett's adoption of Thoreau's disciplined way of looking at what is to be seen; by Spinoza's claims of animation; by Maurice Merleau-Ponty's immanent significance in the living body as it extends to other objects (Bennett 2010b, p.4-5). Bennett's cultural site on that day was the antimateriality of American materialism (Bennett 2010b, p.5). Her encounter was with: a work glove, oak pollen, an unblemished rat, plastic bottle cap and a smooth stick of wood. Except the monotony of that list reduces Bennett's encounter to a sterile inventory of things. The things that surround and infuse are now disjointed and sequenced in a sentence. Bennett was concerned that linguistic means would prove inadequate for the task of communicating her account of materiality. Subjecting her account to my own linguistic treatment as I examine the characters of her speculative onto-story has reinforced her concerns, reducing her account to a glove, some pollen, a dead rat, bottle cap and stick. Her thickened account is easily diluted.

Perhaps Bennett's account can be reanimated. The dilution of encounter by its expression is a disservice to her attempted identification of the moment of independence when those

things combine for affect. Instead, I will recast Bennett's characters in a sketch, rewriting her account with my own observation using Google Street View (a scene shown below in figure 21 as a photo-schematic). The sketch is guided by Emerson to express a static snapshot capturing and inscribing that period of nameless awareness (Emerson 1995, pp.85-86). The period sought is when a vivid sensory impression is registered leaving the description free of mobilised action suggested by a narrative form, instead relying on the brevity of this segment, its stasis potentially revisited to repeatedly incorporate the sketch into a tale.

*Encounter VIII A Google Street View of Things*



Figure 21 - Google Street View of Sam's Bagels and Bennett's Grate on Cold Spring Lane

The grate over the storm drain visible to the lower right of figure 21<sup>80</sup> is wide enough to accumulate a number of items. Glove, pollen, rat, plastic cap, stick. Some are natural and others synthetic. The sight of these is an obstacle to the wafting smell of fresh bagels. Sam's allure is halted. Here lies stuff that commands attention. The first moment revealed their individual existence, their associations with habitual litterer or the results of natural-causes. The second moment a period of nameless awareness when the impossible singularity of combination (its configuration) and intractable complexity has struck at the senses. The moments pass and the smell of fresh bagels advances appetisingly again and combining with a new found presence: that vibratory combination of glove, pollen, rat, bottle cap and stick captured and presented to us from the street infrastructure of the grate.

\* \* \* \*

---

<sup>80</sup> Map data ©2013 Google.



Bennett's onto-story narrates a phenomenological story of affect and objects. The previous sketch instead attempts to discard those narratives in search of that moment of independence, when things combine and affect our bodies. The sight of that configuration obstructs the allure of fresh bagels wafting down Cold Spring Lane. The impact is arresting but without interrupting the bodily sense of motion. There is no time to stop, no narrated time spent gazing at the drain, yet time is stopped. The sketch isolates subsequent frames of reference that snap into view and then recoil within a liminality between individual items and their complex configurations. Bennett's discursive pattern of observation, encounter and theorised sources has been modified and fine-tuned as a discursive pattern of a sketch for inclusion in a tale from which the configurations of things and places as cultural sites can continue to be identified.

Bennett is captivated by that collection of things on the grate. Her recollection of thing-power mentions but leaves in the background a key object to her tale of glove, pollen, etc. The integral background component is the grate. That grate is a stopping place designed to filter out refuse and allow fluids to pass which is exactly as it has done. Although, it is not normal function of a grate to present those items in their own arrangement, their affective assemblage, ready for Jane's attention as she passes by that morning in Cold Spring Lane. It is not the normal function but let's assume a neutrality is possible because it is not abnormal that a grate and associated components of infrastructure have the potential to serve that purpose. Usage can change. The grate is one element amid other constructions that combine to form the backdrop to that scene, that personal sensory encounter for Jane, that assemblage of glove, stick, pollen, etc in their affective relations. Bennett's first encounter with thing-power relied on the mundane civil infrastructure of a storm water system. The grate performed as designed but with unexpected results. Jane saw the grate but why did it not fall within her view, her purview?

What I am recommending is a careful consideration of the broad collection of things that configure sites and scenes. Bennett didn't overlook the infrastructure of her encounter but, I suggest, she did understate it. It was not the function of the grate to select those objects for her review, to represent them to her, but it was the function of the grate to filter them out of its concern: the waterways of that street scene. With that perspective established our view could expand a step further from infrastructure to the environment it services. The grate is a part of a system for fluids that is embedded within other levels of street and footpaths. Perhaps this view would expand too far to stretch to the street as an

infrastructure for motorised transportation and footpath which is an infrastructure for transportation as well. The grate is but one element of an infrastructure embedded in and connected with other infrastructures within which detritus like glove, pollen, etc circulate and gather. Our view has not expanded far but has quickly found it can stretch too far. For this examination the expansive scope of interconnecting infrastructures is reduced to limit our attention to only that grate at that site in that scene.

Bennett's selection of only those items of glove, pollen, cap and stick is an understatement because her tale did not consider the subterranean potential below the grate should those items accidentally fall. Instead she focused her narration on the things brought to the fore by that grate. I disagree with her selection and consider the grate integral to her account. For the sake of argument, the postal box and parking meters in the Google Street View are not integral to her tale. They are additional infrastructures in that scene but they are deservedly unmentioned and are deep in the background even if she had to walk around them to encounter the 'thingliness' of glove, stick etc. The grate is an infrastructural component that is integral to her tale.

Is the grate just another thing to add to that collection, her assemblage of detritus? I don't consider it to be a thing the same as glove, pollen etc. Stuff has a scope and the grate did not combine in the same relations, in that thingly assemblage, as did stick, pollen etc. The grate is part of something more, some more things, some other *things*. The grate is there in service to the site and scenes that Jane Bennett encountered. The grate, I say, is infrastructure and that relationship between infrastructure, site and scene deserves explanation. Another account of infrastructure is required: an account of what I consider to be a glocal internet, if there could be such a thing — such a thingliness. I believe there could.

#### *Encounter IX Darknet: A Glocal Network*

Darknet is a project that supports the construction of localised WIFI networks that mesh together providing an alternative connectivity to the Internet (Paul 2011). The network is at once local and global, perhaps glocal.

There is something special about the fleeting attention commanded by the Darknet Project. There is an 'at once' sensation that imbues this project with a singular moment within a greater dynamic as the evidence of constituent parts, those router components shown in

figure 22, reveal their residual transformative potential to become a distributed network of an immense scale beyond that of its parthood just as the Internet has. The global scale of the Internet demonstrates the potential for this localised networking initiative to scale but that familiar example does not convince me that Darknet will scale. That is why I consider this initiative 'perhaps glocal'.

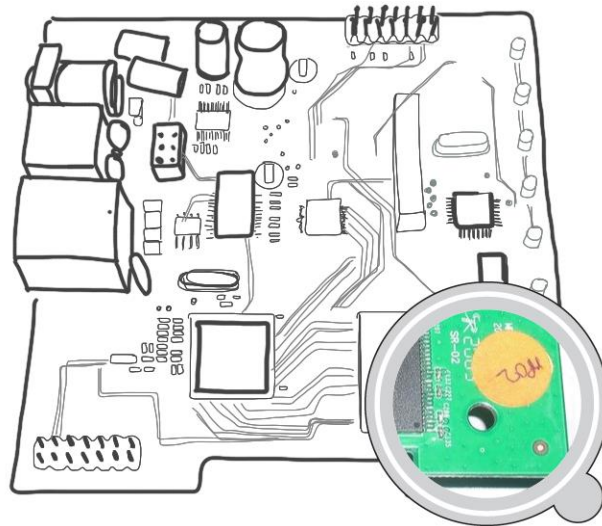


Figure 22 - Router Parthood with Sticker

The growth of this WIFI network relies on a mesh typology of WIFI to WIFI connectivity. How can this network access point which is a composite of electronic components be reconstituted into a mesh? It is hard to imagine how multiple units can be combined into a mesh when each item is redundant on its own, disconnected, and equally redundant were they to be activated en masse at once prior to any of the usual logistics expected of a global initiative. A low power, open source, open hardware mesh access point is a constellation of parts brought together before being relocated, mobilised, deployed in the full and varied sense of the term as this access point is dispersed and installed in such a way as to establish the intended interconnections. The WIFI to WIFI mesh typology depends on the prior movement and installation of access points. Darknet depends on manufacturing and logistics to disperse and unite the many human and nonhuman parts of a WIFI access point in a mesh typology.

The moment of this sketch is a snapshot shown in figure 22 when the cover is off. The box is open, the circuit board is green and more black-boxes are affixed within the technical equivalent of urban planning. Items are placed in a predetermined spatial layout on boards measuring approximately 30cm square in an intelligent design to enmesh the globe.

Of course this unit is not self assembling. Humans were involved. A yellow sticker visible in the figure 22 inset with perhaps 'rp02' written by hand and pen is stuck almost haphazardly on a fabricated surface where everything else has its precise place, allotted according to techno-urban planning as per the mesh intelligent design. As Bennett reminds us, humans are but one member of a complicated web of nonhuman elements that surround and infuse us. Unlike Bennett's tale, the assortment of elements constituting this encounter have not congregated spontaneously at the grate on Cold Spring Lane in a composition like the glove, pollen, rat, bottle cap and wooden stick. This assembly is visible evidence of two states of assemblage. The first state is a pre-assemblage. An orchestration of parts and people, mobilised, unaware of their eventual destination. The second state is another and perhaps not the only other assemblage state. This second state is the deployment of these units to become interconnected nodes in the decentralised mesh network.

This sketch is a reminder of the multitude of parts and infrastructures needed for their mobility. This sketch has already begun to outline the basis for a tale. There is the circulation of elements within a meso-scale machinery of production and distribution. Then the revealing of processes for unification and assembly. Finally independence is redistributed within a greater scale of machinery to achieve a mesh network.

\* \* \* \*

The purpose of the foregoing sketch is to practice Bennett's discursive pattern with material from encounters initiated by this project. The example has revealed two moments of independence when the combination of elements occurs at two possible cultural sites. These two sites are the quality controlled site of manufacture and the domestic site of WIFI deployment across a mesh of households. This example has further demonstrated that the configurations of things and places can be described as a single snapshot or a sketch for re-examining technology-enablement and to provide a contemporary descriptive account of seemingly indescribable assemblages.

The Darknet sketch was in many ways no different to the Cold Spring Lane sketch. Bennett's assortment of rat, glove, wooden stick is equivalent to the capacitors, power supply and yellow handwritten sticker of the mesh access point. Her grate similar to the circuit board backdrop to the Darknet assemblage of electronic components. To take these accounts a step further, to consider their relevance to a contemporary period of technology-enabled media that is on or under the grate, another account of infrastructure is required: a theoretical account of media infrastructure.

### 3.2 An Overhead View of M.COM/DO

This section looks to Mattern and Latour to rethink the componentry introduced by Bennett's account of that assemblage gathering on a street grate through the eyes of those contemporary descendants of the gypsies of Macondo. The gypsies share their insights with an explanation of the componentry they work with:

I approach that as a programmer because that was sort of my world for a long time because my world for a long time was exactly those terms, you know pulling together 15 different bits, plugging them together, that's what most programming is in commercial environments ... certainly a lot of commercial programming does tend to be pulling together disparate elements that kind of hide the complexity ... software libraries, tend to be things which you might be able to implement yourself but it'd be hard work and you may not be able to implement them yourselves, maybe way too much involved and so you kind of just grab the library and, you use it and you never really have to look inside it, so that's what I mean, it's that component based approach, it's sort of like, here's a library for this, a library for this, now I write the glue code that kind of puts them together.  
(quotes 131, 133 & 134)

Like Mattern, I agree with the view that low level historical media infrastructures are often very much alive and continuing to shape experiences by way of the intermingling of temporalities as contested and interconnecting layers (Mattern 2012). Except my deviation from Mattern is a distancing from her aspiring to a media archaeology that "encourages us to look and listen beyond representation" because her intent is to "look beyond the discursive elements of media to focus on ... its logical structure and hardware" which in Mattern's case are "historical media infrastructures" (Mattern 2012). Instead this project pursues a *contemporary* interest in technology-enabled media at a time when Augmented Reality is hand-held shortly prior to it potentially becoming eye-wear.<sup>81</sup>

Here is where Mattern's connection between an interest in and recognition of infrastructure as it relates to media, and, an archaeological view of historical media

---

<sup>81</sup> Section 5.3 closes this contemporary period with a speculative account of the potential transition from hand-held to eye-wear.

structures as intermingling temporalities suggests a presumption I am not prepared to risk and for that I thank Bennett. I need to take care not to ascribe logical structure and that is a risk I would face if I was to trail Mattern and proponents of media archaeology because a future constraint or affordance of technologies needn't arise from any logical structure originating in the infrastructure.<sup>82</sup> In other words, technologies thrive on potential, creating it and making it, and neither they nor their infrastructures predetermine an inherent logical structure any more than did that grate select the combination of rat, glove etc. The grate was just a regular standardised part of a larger system; it was a part in a system of systems. It was not a grate with rat or glove shaped grooves for snaring those items. Infrastructure can have alternate uses just as readily as traces of their past can be located in their present. Infrastructure can provide future uses just like that street grate became connoisseur, collecting detritus and representing it, and demonstrating a new found thingliness to Bennett on that day in Cold Spring Lane.

Perhaps Bennett's example of the street grate with its accumulation of glove, rat and etc has been extended to absurdity. This focus on the grate without rat or glove shaped grooves to snare and present a configuration of items is not intended as a distraction from Bennett's recognition of the power that things hold when they gather and combine by conspiring with humans. This attention given to the grate is a simple demonstration of the relevance of infrastructure and multiplicity provided by it.

This argument shares interests in infrastructure with Mattern. The shared interests are: infrastructure as a historicised shared and ubiquitous system; infrastructure that precedes contemporary media forming a 'long now' stretching from the present into the past; networked layering as a strata of residual pasts, like palimpsests, that continue actively in cultural processes to interconnect layers or Scapes (Mattern 2012). There is a fit between Mattern's perspective of infrastructure as palimpsests and my interests in technology-enabled connectivity using Augmented Reality software that operates on what was once a telephony device to sense, create or construct through layers of media, an informationalised encounter with place. The ubiquitous infrastructure of telephony historically precedes the Augmented Reality App Layar on my iPhone. Meanwhile, that same software constructs, with some help from a global navigation satellite system, layers

---

<sup>82</sup> To reinforce, a contribution of this thesis is the contemporaneous attention to *future enablers* as counterpoint to histories of media and technology as deterministic.

by partial coverage of the scene to reconstruct a media site. That augmented model of representation aligns closely to the fragmented nature of a palimpsest as a text that has been partially erased to make way for another text. However, unlike Mattern, I am hesitant to ascribe a present and future from those past structures. I err toward infrastructure as an enabler not a determinant. The street grate did not have rat or glove shaped grooves yet it was able to serve a different purpose than intended because it did snare those items for Bennett to see.

Yes, I agree, those past structures are present but they're not necessarily active in the way they originally were. They can be repurposed to create whole new configurations as occurs when a GPS signal is used to geotag an image. Past structures are instead dormant future structures. Technology-enablement allows for what Lévy (1998) would explain as modal shifts between actual and potential.<sup>83</sup> To return to Bennett's tale, there is a mild parallel between the alternate role of that street grate (as filter and framing device for rat, glove and etc.) just as there has become an alternate role for infrastructures of global navigation satellite systems like GPS to enable the recirculation of media items amid systems of systems just as occurs with the geotagged photo collections layered in hand-held Augmented Reality.

I will not follow through on Mattern's intent from here, identifying a logical structure of media infrastructures as the determination of any sort of discursive relationship between place and information spaces. After all, for the media elements of this study (that of geotagged photos that constitute streams of imagery representing site and scene) their timestamp is not the timestamp of the GPS signal nor does that timestamp necessarily pervade through internet based publishing systems as an authoritative record of 'when' the photo was taken. The payload of GPS, the time sent by a number of atomic clocks in orbit, is not delivered into subsequent layers and does not imprint into those layers. Mattern's views about the relevance of infrastructure can be noted and some encouragement taken from them but let us instead reconsider the term infrastructure.

Star and Ruhleder (1996) are concerned by the image of certain technologies metaphorically presented as a substrate that disappears into the background. This is what

---

<sup>83</sup> Reconsider that haunting remark from section 2.3 by Deleuze regarding the role of imagination to actualise what is potential and also consider the threat of Buendía's reckless imagination as technology-enablers are adopted.

Bennett has done by omitting that part of infrastructure she identifies as "the grate over the storm drain to the Chesapeake Bay in front of Sam's Bagels on Cold Spring Lane in Baltimore" (Bennett 2010b, p.4) from her tale of the affective power of glove, pollen, etc as that assemblage "shimmied back and forth between debris and thing" (Bennett 2010b, p.4) when it was, I propose, the grate and associated components of a typical street's infrastructure that captured and presented that assemblage of pollen, rat, etc for her attention. Bennett recognised the role of the grate but allowed the infrastructure of her assemblage to disappear into the background of her tale, into the recesses of that scene, to resume an artificially subterranean position despite its street scene appearance.

As an alternative to infrastructures as an invisible substrate, Star and Ruhleder (1996) outline the dimensions of infrastructure as: embeddedness (i.e. sunk into other structures, arrangements or technologies); transparent (i.e. to use without reinvention or reassembly for each task); having reach and scope (i.e. temporal beyond a single event or spatial beyond a single site which is a spatiality shared with a megalopolis); dependent on standards, conventions and a community of practice (e.g. the case of the Qwerty keyboard); visible when broken (i.e. has a conditional visibility or invisibility); built upon legacies, because infrastructure "wrestles with the inertia of the installed base and inherits strengths and limitations from that base" (Star and Ruhleder 1996, p.113). Star and Ruhleder's dimensions of infrastructure have provided some clues as to why infrastructure struggles with visibility when: lost in other structures; far reaching; invisible when operational.

Star and Ruhleder are a counterpoint to Edwards's view of infrastructure as "the invisible background, the substrate or support, the technocultural/natural environment of modernity" (Edwards 2003, p.5). Star and Ruhleder, Edwards and Mattern also reinforce a recognition of infrastructure as a connecting entity. To live within multiple and connected infrastructures is to know one's place in global systems that enable and constrain us because things become infrastructure in relation to organised practices such as when complementary old infrastructures leak into new-media or when media of different eras are layered 'palimpsestically' (Edwards 2003, p.6; Star and Ruhleder 1996, p.113; Mattern 2012). Infrastructure is more than another set of things because that collection of things is an enabler that leaks into other systems—and geotagged photos demonstrate that.

I can take up this perspective of infrastructure by first offering a simple modification.



Infrastructure is recognised and rendered visible as connecting entities amid systems of systems and not a layer of things hidden in plain sight. I require the input of those gypsy informants so as to better assimilate their notion of a layered relationality amid organised practices to the material and immaterial sites, scenes and objects or things of this project. I will continue this reconsideration of the many connecting parts amid systems of systems in Section 3.3 when the contemporary descendants of those gypsies from Macondo arrive in town. I will now finish this consideration of infrastructure with a final comment on Jane's observation.

I have been a harsh critic of Jane's observation (with 'Jane' being the street-level observer). There is so much more to the street scene to include or exclude so why trouble over every part of that site and scene arguing about including or excluding elements when rightly that grate was not a party to the affective assemblage Jane narrated? The reason for my harsh attention to her delineation of scope is a simple one: I recognise the grate as an omnipresent infrastructure whether the elements of it are visible or not. That grate is part of an extensive layering of multiple infrastructures, similar to palimpsests, built upon a legacy of vast temporal or spatial reach that extend into the configurations, those assemblages, we observe but are invisible to us. Should infrastructure be treated as invisible then it fuels Buendía's fascination and is a wasted opportunity because an invisibility only cloaks integral technologies thus creating a conduit of stagecraft and automagic: fuel for a furtive imaginaire. The tendrils of infrastructure offer potentiality beyond their actual use whether imaginary or real.

Bennett has drawn our attention to the accumulating materiality in plain sight. I have extended this accumulating materiality to include items that appear as unseen: items otherwise considered infrastructure. Bennett's rat, pollen, etc were gathered in a way that fascinated and revealed their thingly vitality. Those items captured and drew her attention to their composition: a relational configuration. What I am looking for and what I see are the site and scene. I am seeking a renewed relationship between place and information spaces that is an alternative to virtual and real distinctions and instead reflects a contemporary mobility as human and nonhuman arrangements assemble in or beyond the street scene Bennett narrates. I revisited Bennett's street scene as a Google Street View and what I encountered, what her scene narrated and presented, was the grate. Latour's reappearance in this argument is now overdue. Latour and Bennett in tandem will help explain, help elaborate, help to prepare a reformulated materialism.

We found Jane Bennett in a street scene and revealed the presence of unseen objects in plain sight or buried below surfaces of road, gutter and pavement. Her location is a site and scene that is typically urban and typically human. It is possible to walk those types of street in many urban settings. Latour shifts our attention to spaces above. He directs our gaze to the inhuman space of orbit where humans have located nonhuman objects to circulate overhead like synthetic birds. This zoomorphic analogy is neither carrier nor carrion because it is important to resist the temptation of Vinge's concern about fang and talon. Those nonhuman orbiting objects deserve a presumed neutrality without human concerns being projected onto them. Motivated by Latour's rally against *socio-* explanations we will examine his conception of a network of associations as illustrated by his reference to satellites. Those satellites are another case of materiality that may or may not harbour human concerns in those nonhuman devices and technologies found at our sites and in our scenes.

To continue with this examination of infrastructure I will switch attention to that example introduced by Latour: that of the GPS global navigation satellite system. After all, locating ones photo collection as I did in section 1.2 is a vastly different enterprise<sup>84</sup> to navigating by GPS signal. The geotagging of images and their deployment to Augmented Reality layers has built a layer on top of, or alongside of, but somewhat divorced from what Mattern would most likely refer to as a logical structure and hardware of navigation. Alternatively, I refer to these circumstance as a logical structure and hardware of global timekeeping, because geotagged media items have become a time-stamped and location aware item in a collection. The geotagged media have become more than database as media that represent sites and scenes circulating in vastly distributed and interoperable systems of systems. What does Latour say of this, this usage of GPS?

Latour speaks of new networks that have increased the material dimension of networked associations by way of the "expansion of digitality" because the more digital then the less virtual and the more material a given activity will become (Latour 2011, p.6). Latour goes on to explain, that this increasing materiality is evident because "everyone knows that there is no GPS without three satellites" (Latour 2011, p.6).

---

<sup>84</sup> Usage of the term 'enterprise' is conscious of the double meaning as a complex undertaking of activities or another general term for institution, firm, organisation etc. The case of Astrodynamics in section 5.1 explores an instance of the latter usage as foil to the individualised activities of section 1.2.

Yes, I agree with Latour, that digital occurs with and by way of a vast materiality just as Bennett's rat, pollen, etc come to be, shift locations, and eventually accumulate on that grate by way of their own particular infrastructural path. That vast materiality is a configuration of circumstance and physicality combined with environment and events. Except, and here is where I deviate from Latour because his example diverts from a more intriguing set of concerns by focusing on quantity alone, the three satellites, to illustrate and support his argument that digitality increases material dimensions and does not offset the material by creating some virtual equivalent. Latour's emphasis on quantity when focusing on an increasing materiality misdirects from a consequence of these increasing materialities. Latour appears to sense there is more to this matter, be this a matter of facts and/or concerns, because he suggests "this is where things become complicated and where digital expansion given to information techniques is going to have huge and fascinating effects" (Latour 2011, p.5). What Latour does not realise is that a fourth satellite is required to check for errors in the earth-bound GPS device (Bhatta 2011, p.126).

My deviation from Latour is that the geometry doesn't require four satellites because the math needs only three. A device can self-determine its location but there is no global positioning without four satellites overhead and connected. The math requires only three satellites to calculate spatial location but the device needs at least four satellites. And, I am not merely making a pedantic numerical correction to Latour's argument about the increasing materiality that is a consequence of digitality. The fourth satellite is not just one more. The circumstance of this requirement are, like Latour suggests, fascinating to the extent that the circumstance of this fourth satellite incites wonder and invokes the spectre of Buendía.

Buendía's reckless imagination requires immediate abatement by way of quick explanation: the fourth satellite is necessary to compensate for the clock in the earth bound and hand-held global positioning device because interoperable precision is vital (Groves 2008, p.11; Bhatta 2011, p.61-64). There is no automagical reason for the expanding materiality of global positioning systems because, put simply, we can't carry around a hand-held device that houses an atomic clock to match the clocks in the constellation of orbiting satellites that circle our earth. Four satellites are required to compute the three coordinates of our position *and* to find the error in the earth-bound receiver clock (Bhatta 2011, p.126). This simple explanation should quell Buendía's potentially misplaced curiosity, a curiosity that should heed the cautionary forewarning from Latour that "this is where things become complicated" (Latour 2011, p.5).

Complication is not an occasion for reckless imaginations. With Buendía's imagination held in check by a simple explanation, let us continue with a complicated view of GPS: a review of assisted GPS.

*Encounter X Witnessing Assisted GPS*

What do you see when there is nothing to see? Technologies can be immaterial and this next sketch will attempt to isolate the spatio-temporal moment, that nameless awareness, when immaterial technologies perceptibly exist on their own. This sketch will be repeated to form a bi-directional tale. The first direction is motivated by Software Studies, to reach a level of practice that manifests in code to inform a theoretical examination of these encounters. The second direction is encouraged by Latour's interest in the expansive materiality of digitality as evident in his quip that to have GPS you need multiple satellites in orbit. The first direction travels from physical and observable to the immaterial. The second direction from the immaterial to physical.

The site is a precise spatio-temporal moment and the sketch is of a particular scene. In the foreground of this scene is my iOS location cache. In the background is Apple's explanation.

The foreground of this scene is a combination of: latitude, longitude, horizontal accuracy, altitude, vertical accelerator speed, course, and confidence. Time is the duration since the epoch of Cocoa which is the programming language used for Apple's OS X. Time is not represented as a typical measure of time such as a combination of years, days, hours and seconds. Instead, time is a numerical value stored for efficient calculation.

The background to this scene is connectivity. There are other data variables related to proximity, as suggested by Apple's explanation of the connectivity in this scene: "to provide high quality products and services that its customers demand ... [location services] must be able to determine quickly and precisely where a device is located" (Sewell 2010, p.5-6). The proximity variables are a necessity of customer service. "Information about nearby cell towers and WIFI access points is collected and sent ... with the GPS coordinates of the device, if available" (Sewell 2010, p.6). The GPS coordinates seem optional. Determining actual location is a roundtrip journey from device to the company, to one of another two companies for iOS versions prior to version 3.2, and back to the device (Sewell 2010, p.7). The explanation "information about the device's actual location is not transmitted" (Sewell 2010, p.7) may appear contradictory if the geospatial data is assumed to be accurate.

Perhaps it is best to be generous and assume the author accepts and acknowledges the inaccuracy of geospatial data as a basis for why actual locations are not transmitted.

For assisted GPS, the device uses the known location of the means of connectivity, be it WIFI or cellular network, to determine its actual location. The determination of device location is apparently after contact with that infrastructure, specifically, with the geospatial details as specified in that infrastructure's configuration settings. The determination and supply of latitude and longitude datum for the device are rendered by this explanation to be geospatially irrelevant. In this sketch, the determination of location is achieved through a nearby intermediary: the physical unit that provides network access. The immateriality of data, specifically geospatial data, does not appear to exist independent of material objects. There is no spatio-temporal moment of independence captured as a sketch, yet. The device is tethered. The device is spatially determined by the means of its connectivity.

Data can be revealed to have a life of its own when we analyse the explanation given for the maintenance of the dataset. A similar dataset is stored and transmitted periodically to update a database with location data (Sewell 2010). In this description of the same scene, "the device intermittently and anonymously collects cell tower and WIFI access point information from all the cell towers and WIFI access points that it can 'see' along with the device's GPS coordinates, if available" (Sewell 2010, p.7). This information is transmitted every 12 hours or when internet access is next available. Without intervention the data is captured, stored, periodically transmitted, and presumably—because the explanation implies this—used by automated processes to maintain and update the location database. People don't handle datum and datasets like this. Amassed armies of personnel are usually those tasked with making war or money not housekeeping of information. Global quantities of data are acting on data.

The process of aggregation grinds and polishes each discrete datum into a state of precision. This is a process of conformance to shared external values not a manufacturing process that grinds and polishes to a desirable standard of quality. The choices are not likely to be those made by the many contributing parties. This is not democratic. The calculations for grinding and polishing are most likely algorithmic and embedded in a distribution of systems. The distribution of a single agency is possibly confused by many different versions of software over time; the multiple personalities of algorithms.

The two comparative elements that are the figure and ground for this scene have now been introduced. The data from my iOS location cache is in the foreground and Apple's explanation is in the background. There are other elements to include.

First, there are the additional elements that fill and clutter the peripheral field of view. The nearest foreground elements that are close enough to still retain some focus are: the iPhone device, the Crowdfunder code project (Kreil 2011) to retrieve the data file already exposed (Neal 2011; Warden & Allan 2011), my PC with iTunes Media Library file, and iOS version 4.3. The significance of the latter is that access to this data was promptly concealed when iOS version 4.3 was superseded by version 4.3.3 on 04 May 2011 (Apple Inc. 2011). Retaining version 4.3 has required diligent effort. A mis-read and confused acceptance of a dialogue box is enough to lose foothold, slipping back into a continuous stream of upgrades and patches. Second, there are atmospheric conditions in this scene. A natural haze between figure, ground and beyond into the distance. This is not an actual system explanation because, admittedly, it is a speculative reconstruction from Apple Inc.'s explanation. It is a critical reassembly of components from a rhetorical device.

A variety of human agencies are also present. So far, there is user-me and solutions-me, perhaps even hacker-me. I am user-me because I am a person who carries and operates an iPhone that has generated and supplied the location cache data file. I am hacker-me because I have sought out the code and run-times to locate the location cache file, opening it to inspect the data file and check integrity of the data values. I am solutions-me because I have reconceptualised the sub-processes and components that make use of and contribute to this data-set. And there are *others* not yet explicitly mentioned. There are user-others, hacker-others, solution-others and a whole range of human actants enacting the roles they either assume or are cast in as a result of their adopted technologies and intentions.

The resulting scene established in the preceding description of assisted GPS has foreground, background and elements in peripheral view. There is human and nonhuman activity. All of this activity somehow combines or disassociates in configurations that construct a mediation of site and scene: an augmented sense of space and time.

**Sketch:** A Latitudinal View of Digital Space

The first sketch I will attempt follows from the description of the scene. This sketch traces parameters of configuration from the immaterial to physical elements as I look for any

sense of state transition when the configuration changes from immaterial independence to physical co-dependence. This sketch begins with a single second: a very human moment that is a sequence of locational data.

What better place to look for a moment than in a moment? The first sketch I will attempt is a momentary period when I was sitting in the Wellington airport waiting for a flight. It was a sunny day. I was most likely in one of two places, either: seated at the window in the food court area or seated down at the gate awaiting the boarding call for my flight. Checking my itinerary confirms that the departure time for Flight NZ5098 was 17:30 and the most likely place I was when using the location services of my iPhone was inside the terminal.

The period that I spent in the terminal using my iPhone while waiting is not the moment I refer to as the moment I will inspect for immaterial independence. That period waiting is a long moment: a human moment. Instead, the moment I will inspect is the single second at 336456510.084274 seconds since the epoch of Cocoa. The moment I will inspect is NZT 16:08:30 because then, at eight minutes and thirty seconds past four on Wednesday the 31st of August, my iPhone wrote to the location cache 102 separate geospatial entries.

Wed Aug 31 04:08:30 2011 GMT or 16:08:30 NZT				
CI	Timestamp	Latitude	Longitude	H.Accuracy
2086928	336456510.084274	-41.33179581	174.81502950	1414
2086828	336456510.084274	-41.33159577	174.81283575	1414
2086831	336456510.084274	-41.32962942	174.81031137	1915
2086832	336456510.084274	-41.32243138	174.80949348	1490
2086827	336456510.084274	-41.32073587	174.81963765	1414
2086830	336456510.084274	-41.31838136	174.81920963	1414
2086790	336456510.084274	-41.31960129	174.80250215	1414
2086788	336456510.084274	-41.32819586	174.79398089	1414
2086929	336456510.084274	-41.32981646	174.79324829	1414
2086791	336456510.084274	-41.32170623	174.79604011	2047

Table 1 - Ten Sample Data Records from iPhone Location Cache

That moment was a busy moment. Not too much can typically happen within a single human second when people and things interact in space. I can probably move my pen and write 'one' as quickly as that single second passed and in a fraction of a second I can probably press a button, maybe two buttons, initiating some action on my iPhone. I can look away, and back again, my gaze taking in everything between the two points of 'away' and 'back' as I glance quickly around my surroundings for any number of things. The iPhone

appears to have glanced around 102 "cell towers and WIFI access points that it can 'see'..." (Sewell 2010, p.7) and a sample of these are listed in table 1 with several locations mapped in figure 23.<sup>85</sup> Here is another form of nonhuman gaze<sup>86</sup> and this one helps to update and maintain Apple's database of known location information from cell towers and WIFI access points. The iPhone was surveying the surrounding area for cooperative intermediaries who are willing to surrender information for the future benefit of others.

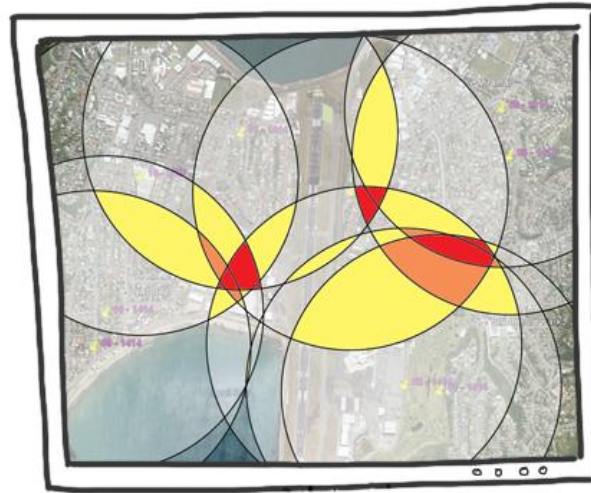


Figure 23 - Plotting Location By Network Connectivity

The locations recorded range from  $-40.97200918$   $175.31323295$  in the North East to  $-41.22768074$   $173.15663903$  in the South and  $-41.34510916$   $174.76987957$  in the West. The extent of the iPhone's gaze is simply incomprehensible. Figure 23 illustrates this incomprehensible gaze by plotting a sample of recorded locations, none of which combine to identify my actual location. The intersecting regions extended from each recorded location are shaded yellow, orange or red with red indicating the most shared intersections. From this photo-schematic it is apparent that were that data recording my location then the iPhone thought I was at once on opposing sides of the runway, plus a few other locations. Perhaps this is networked sight not a line of sight. This talk of 'sight' a confusing extension of Apple's explanation that the iPhone 'sees' physical network equipment (Sewell 2010). The iPhone through connectivity receives locative information from those physical network elements but this is not yet the sought after transition from immaterial to physical that is attempted by this sketch.

<sup>85</sup> Map data ©2012 Google.

<sup>86</sup> Recall the visualisation of a photo collection from Atiu in section 1.2.



The sketch extends from iPhone to cell tower or WIFI device; connectivity is established and configuration data exchanged. An unanswerable question is how the location data for each device is determined, configured and then maintained over time as equipment is re-deployed. For the time being it is sufficient to assume that this data is not generated in real time from GPS signal for each request and is instead configured and stored data, potentially kept in memory for quick response to many requests, then dispatched to inquisitive iPhones that store and batch transmit every 12 hours back to Apple but only over WIFI connection.

The sketch so far is of a networked gaze that exchanges datum about each sighted node and relaying that over WIFI not cellular networks to the company that initiated this action when it designed and subsequently released the software. An intention of this software is to 'assist' GPS for the sake of an improved consumer experience. In this moment, the iPhone sight has exceeded constraints of location. It demonstrates an independence from physical matter by passing from one physical network device to another.

The sketch was complete at the 12 hour milestone. This is the point when constraints of space and time intersect at a level that again relates to a human scale. The iPhone checks every 12 hours whether its connectivity is via a WIFI or cellular network before transmitting the updated version of its location cache. The requirement for WIFI, a specific type of network, at that scheduled time is a physical co-dependence marking the state change when its immaterial independence ceases. The exchange of data from local to global depends on a particular type of network when scheduled.

The sketch was a nonhuman moment of intense activity. The sketch covered a period that appears to my human self as a concurrent mass of requests, although, that is speculation on my part because the data is not insight into the black-box nature of these proprietary technologies. It is impossible to know if the requests were a concurrent broadcast to all network devices the iPhone could 'see' or simply the illusion of this intensity is created by the timestamped writing to the local cache file of datum from a data structure held in memory. The meaningful sequence of events has disappeared. Events have been amalgamated and reformed as the moment of immaterial independence.

It is tempting to suggest this is a form of time compression except the overall timeframe is a rigid 12 hour window that is potentially disrupted, stretched, should a WIFI connection be

unavailable for transmission of local data to join the global data-set. Time is measured precisely and it flexes as required. Networked sight instantaneously traverses multiple sites and then periodically re-aggregates itself. This is a sketch of network visibility when 'location' needs to be routed through an internet of technologies to either assist the Global Positioning System of this device or to assist with the global positioning of an individual.

**Sketch:** A Longitudinal View of Digital Splace

The next sketch is seeking that moment from this scene when the physical converts irreversibly to an immaterial state. Inspired by Latour and the speculative solution diagrams of technology professionals, I will attempt to illustrate as many identifiable objects and things as I can until I reach the reasonable limits of what is matter and what is code.

I will begin my identification of objects in the realm of humans by starting my list with the things I can touch and must handle. These material things are peripheral elements in the scene. The iOS location cache has no physicality and Apple's explanation of their global system is rhetorical. The first object that seems to be my nearest point of access to the immaterial state of this location cache is the specialised USB cable that connects the iPhone to my PC and transfers surreptitiously this cache file as part of the typical back-up process that runs when cable is connected. The iTunes software automatically opens carrying out sync and back-up sub-processes as it establishes connectivity with the device. Having stayed on iOS version 4.3, the immaterial process of 'over the air' back-ups is not yet available to me. The universal connecting cable is still all-important.

It is a simple cable with two end points. Each end point adds another item to the list of things I can touch—I must touch—to plug-in the device and initiate the process that will eventually result in access to the iOS location file. The two other items are desktop PC and the iPhone. Each of these objects also encapsulate their own collection of sub-parts. The PC with case, keyboard, mouse, monitor, cables and the iPhone with case and screen protector. The former case is an object that protects and conceals a myriad more of cables and components. The latter case is simply to protect the device from abrasions and that is a role shared with the screen protector.

These are some of the objects within reach that I touch as I access the iOS location cache. Apple's reach is different. Their reach is remote and the material objects they require to *touch* this cache of data is an operating WIFI access point. They require the iOS device to

have WIFI enabled in the setting and for it to be in proximity to the WIFI access point, within range of the WIFI connectivity, and for it to be accepted, having been given and then exchanged with the WIFI access point sufficient credentials so that it is authorised to use the network connectivity that is available at that scheduled time. The route from access point to Apple is a transnational path of cables that is an undersea, subterranean, bundled, buried and behind closed doors materiality<sup>87</sup> deserving detailed examination but such a mass of conduits is a scale and reach beyond the scope of this project. The scope required here is not to trace wires and conduit but to trace the im/materiality and im/mobilities of technologies as occur in human and nonhuman formations. The physical transportation layer can be dealt with separately as a continuous materiality and I will instead maintain focus on the observable objects or things that surround the device.

Between WIFI access points and device is power. Electrical power enables the device to be an active member of the network. Sustaining that state of continued connection drains power. An on-board battery and the means to recharge it are surrogate physical connections between the material objects of WIFI access point and device. Electricity exists outside the device and enters through physical cable: the same cable that is used for data transfer between PC and device but is extended by a wall socket plug. These are the objects I handle. I do handle electricity. It is just that it is insulated from my touch so that it travels to its intended destination.

It is easy to accumulate peripheral and sub-components. A keyboard and mouse were identified as connected objects I handle. An on-board battery is a subcomponent to the iPhone. When considering the battery, I too readily assumed a tactile experience that doesn't usually exist. I don't handle the battery and can only reveal from another source, an iFixit teardown (iFixit 2009), the shape and location of the battery. But I do handle electricity. It passes through my hand as I hold cable or device. The material nature of conduit and surrounding insulation guiding the direction of the current which has been established by hand as I plug it in.

This is an everyday household observation. It might reflect the material electronic objects of one or many that are used in contemporary settings to locate oneself and others. The

---

<sup>87</sup> The online documentary *Bundled, Buried and Behind Closed Doors* (Mendelsohn no date) illustrates but one concealed node in a global network of conduits.

disassembled case, phone and screen protector offer a degree of itemisation for the sake of this exercise. This clutter of objects is a dissatisfying collection when restricted to the sub collection of physical objects within human reach and able to be observed in a single encounter. This particular scene of analysis is not an everyday view: it is a collection of near and far objects. I will next extend the visible objects I handle to include a greater range of enabling component technologies.

The sketch so far is a tactile inventory restricted to what I perceive and can handle. The speculative solution diagrams<sup>88</sup> of technology professionals, those informants I characterise as contemporary gypsies, contain more as illustrated by figure 24 below.

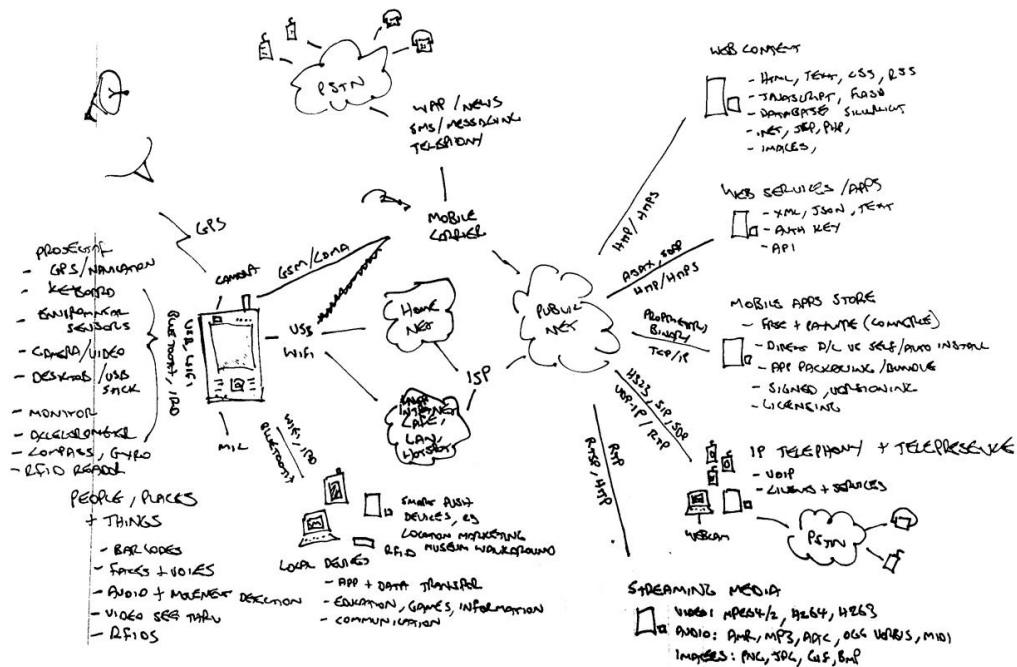


Figure 24 - Technology Enablers of Augmented Reality

Their diagrams were not asked to discriminate between hardware and software and so they are a picture of matter and immaterial substrates located near and far. The various informants combined in an almost illegible schematic form all manner of enabling components. Those components were large in scale ranging from the power distribution network identified simply as a connected box labelled 'Power distribution' through to: GPS satellite, web server, the public switched telephone networks which is a cloud labelled with the acronym PSTN. There were also material components small in size such as on-board

<sup>88</sup> Refer to appendix 2.2 for the protocol followed during this encounter.

camera and reciprocating webcams, RFID (for whatever reason, I'm not sure), GPS chipset, screen and gyroscope. The diagram is part pictorial, part electronic composition and barely legible like that scrawl of quality assurance on the Darknet router in section 3.1. The diagram is a representation of socio-technical assemblages which on this occasion is a specimen of an interoperating system of systems.

The electronic composition from figure 24 is not populated by people. People are typically located nearby the devices that exist to be used. Stick figures indicate that lines and a circle combine into a person often labelled as a user. People are implicitly located nearby the devices even if they are not used as such because devices require configuration when deployed. The purpose of this explanation is to construct a tale of a momentary period of nameless awareness (after Bennett) when the immaterial technologies exist on their own and independent of humans. Befittingly, an unpopulated diagram helps illustrate this scenario and prompt for the presence of humans amongst these technologies. The unpopulated sketch of component technologies in figure 24 evokes that moment. This sketch is attempting to isolate that point when the technologies achieve their immaterial independence. This is a challenging observation to make because this scene is littered with physical elements that each contain, as was demonstrated by the Darknet mesh access point, an inventory of parts that are easily disassembled and which operate satisfactorily without people.

Perhaps the numerous lines on the diagram could be interpreted as immaterial flows with a dynamism that is independent of the array of objects. Perhaps not. The lines indicate association more than a firm sense of directionality and travel. Perhaps the clouds and lightning bolts could be the technological equivalent of an immaterial natural force. A contained but not spatially determined region that is governed by electrical current. Perhaps this isn't the material independence I am looking for. Those clouds are presumably tethered to access points and other network paraphernalia like the Darknet mesh. The lightning bolt between phone and GPS representing something of a point to point immaterial connection between physical parts.

An alternative form of immaterial independence is the aggregate of the many acronyms on the diagrams. Those acronyms each referring to an individual standard or protocol, or other kind of named and prescribed technological entity. The diagrams are littered with these references. Already some have crept into this explanation, infiltrating a rather human

attempt at understanding the interoperability of all of these parts. These acronyms have infiltrated my mind having escaped from their counterpart material technologies. The litany of acronyms forms an immaterial substrate that is independent of the substance of technologies. Acronyms such as XML or JSON or PSTN or USB or DNS mixed with others like ISP, GPS and GUI. The latter set of acronyms are less closely related to any one technology. Instead they are shorthand for amalgamations such as Internet Service Provider, Global Positioning System and Graphical User Interface. Not all three letter acronyms are equal on this immaterial substrate. These informational sources suggest they exist in lives of their own.

\* \* \* \*

Bennett suggests a vitality amid the things that reach and project themselves by connecting with an accumulating materiality. The preceding sketches have extended her account of things by revealing how our collective selves and individual *Self* are embedded, not unlike infrastructures in infrastructures or systems in systems, within an accumulating configuration of materiality. Bennett's materialism is a vitalism she refers to as thing-power. Her focus is on those things in the foreground and less so the background of items. I argue that a focus on foreground things understates the extent of those background things. In the earlier Google Streetview encounter I illustrate how Bennett's attention is drawn — in the case of glove, stick, pollen etc — to a foreground that neglects the street grate despite its role (as infrastructure) in forming that assemblage and presenting it to her. There is a demonstrable limitation to what Bennett's thing-power can offer this thesis.

Latour also recognises the contributing role that parts play. Latour shares with Bennett an interest in the capacity of objects or things to act in human and nonhuman collectives (Latour 1999b; Latour 2004, p.76; Bennett 2003<sup>89</sup>; Bennett 2010b). This prompts a response from this project as it pursues these connections amid the accumulating materiality of digital technologies. Latour also recognises that digital techniques have introduced a traceability of associations between individual and collective which he refers to as the rematerialisation of network datascares, a rematerialisation which has introduced "the multiple and fully reversible combinations of highly complex individual constituents and multiple and fully reversible aggregates" (Latour 2011, p.9). The detritus swept and accumulated by unseen infrastructures still captivates and receives human attention. This

---

<sup>89</sup> This marks an early milestone in the development of thing-power when Bennett makes connection to Latour's collective and Barad's intra-action of humans and nonhumans, which I take up in section 4.1.

materiality is not offset by virtuality and Latour struggles to identify the extent of that materiality as revealed by his limited attention to only three satellites.

Latour and Bennett combine in this chapter to prompt for a response to these augmented digital circumstances: an examination of the connected things of places and information spaces. My attention is not strictly on street grates but instead is propelled, on occasion by the fascination of Buendía, to examples such as that fourth GPS satellite when the math would suffice with three. Bennett and Latour combine to support my extension of Bhaskar's de-anthropocentrism to technology-enablement<sup>90</sup> but their input has its limitations as I continue to query whatever complicated configurations we are a part of. Being a part of these complicated configurations suggests these things may not be mute and the next section instead seeks the input of informants.

Practitioner accounts of technology and technologies are included here to decentre my human self as I examine the objects and things of this study. These accounts from informants preserve the human-ness of these synthetic technological constructions hopefully counteracting and not fuelling the reckless imagination of Buendía. Just as the honest gypsy Melquiades clearly told Buendía "it won't work like that", I too trust that the accounts of Technology and technologies of the descendants of those gypsies of Macondo will also describe how they might work or at least if things don't work like that. I look to these accounts to provide an emic basis for a revised discursivity that can analytically frame the details of the complicated materiality that Latour and Bennett are drawn to: the thingliness they explain. What is said about those things that are technologies of an indescribable distributed materialism?

### **3.3 A Moment of Complication**

That's what most people are working with now, they're working with quite large atomic building blocks.

(quote 142)

Technologies can be complicated but is Technology complex? This question was prompted by informant explanations of the construction of technology. This question is raised as preparation for a key difference that is introduced in this section: a difference that matters

---

<sup>90</sup> This extension of Bhaskar was explained in the Introduction as technology-enablement that are human constructions of nonhuman objects and things that endure and operate independent of but also amid human relations.

when considering formations of human and nonhuman collectives as occur for the use-case of Augmented Reality technologies. I will review informant responses to questions about their experiences of 'Technology' and 'technologies' in a professional context to ground the explanations of those things, Latour and Bennett's thingliness, in an account informed by in-depth engagement and practice with things that are 'atomic building blocks'. This section begins with the ethnographic accounts of complication or complexity by informants, those contemporary gypsies of m.com/do, then shifts to an examination of the distinction between complicated or complex that is informed by Complexity Theory.

The remark about atomic building blocks reminds us that the specificity raised in chapter two as proposition one operates in discursive relations explainable as a multiplicity of media and technology. This section asserts the first insight of proposition two (revealed by qualitative coding explained in appendix 2) that this multiplicity of media and technology, specifically the hand-held photo collections of Augmented Reality, is a human construction that is either a complicated or a complex advanced construct. This first insight of proposition two arose from and remains grounded in the dialogue with informants. The terms 'complicated' and 'complex' were used interchangeably thereby indirectly reinforcing technology as complicated *or* complex.<sup>91</sup> Informants described technology as:

... a synergistic thing so that we're able to do more than we could imagine or more than we imagined we would  
(quote 17)

... a collection of individual technologies that work in harmony or together or are applied as a collection rather than being a new technology  
(quote 22)

Or reminding that the complication or complexity exists but is hidden because:

... a lot of the things we would consider technology are, you know, hidden, in a sense that the wires are in the walls and the switches are in the network cabinet and all the amazing technological processes that kind of actually make Farmville run  
(quote 59)

---

<sup>91</sup> See the analytical memos in appendix 2.6 for an expansion on this.



Which is a perspective on technology as hidden (i.e. wires are in walls or switches are in cabinets) that suggests much of technology is to provide shelter to others from itself so that your perception is only that:

... you see the end result of all this huge amount of complexity  
(quote 61)

From the first insight of proposition two follows a second insight:

**These advanced constructs are complicated or complex and there exists a difference that matters between complicated and complexity that warrants distinction to support a closer examination of hidden things.**

This section clarifies the second insight of proposition two as a distinction between complicated and complexity as it relates to technologies and their construction.

The difference here between *technology* and *technologies* is more than the difference between a singular and plural form. The difference between technologies and Technology is the difference between the plural of many synthetic or constructed entities that are referred to as 'a technology' because they purposefully extend human ability and the collective which refers to a difficult to define combination of technologies in society. In this context, the question 'is technology complex' accepts that 'a technology' may be a complicated construction and it queries if these complicated forms connect, to combine and interoperate, producing Technology that becomes irreducibly complex.

The terms *complicated* and *complex* could conveniently be used as synonyms. That is not the case here. I deliberately use complicated to refer to the form and properties of technologies with their componentry and parthood. I use the word complex as a foil to the term complicated and to refer to the collective form of Technology explained above recognising also a vitality suggestive of the vibrant matter Bennett seeks out. This approach is motivated by Anderson who, grappling with the limitations of reductionism and the differences that occur with scale, suggested that large and complex aggregates are not simple to understand by extrapolation of their properties because new properties can appear at each level of complexity which result in new behaviours (Anderson 1972, p.393). For Anderson, complexity is more than a matter of scale because of the likelihood of emergent behaviours. My usage of the term complexity questions whether the difference between the complicated of particular technologies and the collective of Technology is the

emergence of a new vitality operating in society that is irreducible to enabling technologies.

The following parts of this section will compare the complication or complexity of technology. First, practitioner accounts provided by informants characterised as contemporary gypsies of m.com/do will be analysed. Second, the interests of our informants will inform and be informed by an examination of theoretical insights gleaned from advocates of complexity theory.

An informant used the words 'complicated' and 'complex' interchangeably when responding to the question that asked how they referred to 'Technology' in practice. They said "technology is most often used with advanced things that appear to be, I was going to say technological but, appear to be complicated or complex" (quote 9). Adopting the principle that complexity is irreducible, as suggested by Anderson (1972), this informant's response can be clarified by extending this analysis in order to situate the use of keywords 'complicated' and 'complex' within modes that are either reductive or irreducible.

The informant explained the term technology as an advanced construct made by people to suit a role (quote 1). Their view of technology was subsequently explained as an entity that can be "a building block" (quote 4). They introduced the notion of 'multi-disciplinary' to articulate how a combination of different technology types such as computing, electrical and refrigeration technology can combine as multiple technologies in another technology such as a motor vehicle (quotes 11 & 12).

I interpret the informant's responses as reductive. They respond to questions about technology and technologies by interpreting technology as complicated and reducible to component sub-systems such as computing or refrigeration that in turn could be used as building blocks to construct technology. For this informant, Technology can be reduced and then reassembled.

Another informant referred to technology as simple or complex. They said technology "doesn't have to be sophisticated, could be very simple or very complex" (quote 15). Their use of opposing alternatives establishes a continuum where a technology could take a range of forms, such as a component technology or a tool set, which may be identified on a continuum from the very simple to the very complex. Their use of the keyword 'complex' is reinforced by their expectations that there potentially exist relationships between technology and people or between different technologies that enhance and extend what

was originally possible: "sometimes it's a synergistic thing so that we're able to do more than we could imagine or more than we imagined we would with the tool or technology" (quote 17).

The informant went on to speak of "a collection of individual technologies that work in harmony or together or are applied as a collection rather than being a new technology" (quote 22). These collections of technologies that work harmoniously are a new constructed form "where their purposes maybe aren't necessarily always aligned but you kind of lash them together for some other outcome that you're aiming for" (quote 23). There is no further differentiation and explanation by this informant to explain that complex technologies unite in some form of harmony whereas simple technologies don't.

Perhaps there is a risk when seeking a simplicity from individual technologies that so readily combine in collectives to become complicated or complex. The informant considered the simple as operating amongst the very complex. Their understanding is that the combination of simple technologies and complicated technologies achieves a level of complexity that results in emergent behaviour as suggested by terms such as synergy, harmony, or collections. Their explanations about the construction of technologies contribute to an emerging discursive frame. That informant's explanation of technologies also reflects Anderson's (1972) understanding of complexity: more is different.

This part has reviewed responses by informants to questions about Technology and technologies. Their responses mentioned complexity and complication, notions that were considered in light of a principle suggested by Anderson: complexity is irreducible. The next part examines a contemporary turn to complexity which elaborates on what Anderson started.

Already, it is apparent that Complexity is an ontological state that requires careful consideration. It is a beyond human state that is irreducible and more. Complexity is also a useful descriptor for Technology, a natural fit, which is somewhat surprising that a beyond human descriptor is used to describe human constructions. My surprise is best explained by acknowledging a residual tension between: the dyadic use of complication and complexity; Latour's concern with an all too convenient 'socio-' explanation for beyond human phenomena; the global, individualised dispersal of heaving and circulating media items at large in the world. What more can be explained about complexity as it relates to the

technologies that enable a media system of systems such as Augmented Reality?

The following review of complexity is a milestone after the establishment of m.com/do (by Fielding's REST architecture) when Urry marks a turn to complexity; a turn that recognises the emergence of complex structure which challenges everyday notions of social order; a turn that shifts thinking from reductionist analyses to studying complex and adaptive systems (Urry 2005b). Urry situates complexity discourses at the pivotal moment of a turn that he suggests has co-opted or at least complemented globalisation discourses (Urry 2005b; Urry 2005a). A counterpoint to those beyond human global forces is Nowotny's isolation of the tension between increasing complexity and our human need to reduce and describe it (Nowotny 2005).

This review of complexity is looking for insights to distinguish between complexity and complication. The informants established the relevance of complexity theories to this examination of global technologies that enable Augmented Reality. Informants acknowledged the complexity within their accounts as they explained how their roles contribute to the beyond human scale of constructions that are complicated or complex formations of technology. This review is looking to established theories of complexity for a vocabulary to describe the indescribable encountered by those contemporary gypsies of m.com/do.

Urry refers to the complexity turn as "the emergence of a more general 'complex structure of feeling' that challenges some everyday notions of social order"<sup>92</sup> (Urry 2005b, p.1). For Urry, complexity is not the same as complicated because complexity is emergent, dynamic and self-organising systems that interact in ways that heavily influence the probabilities of later events through their "ability to adapt and co-evolve as they organise through time" (Urry 2005b, p.3). Urry doesn't elaborate on the distinction he draws by explaining what it means to be complicated. He does continue with his explanation of complexity by adding that systems, which is what complexity theory investigates, "are irreducible to elementary laws or simple processes" (Urry 2005b, p.3). It is the difference between irreducible and reductive that I will examine and use to differentiate complexity from complicated.

As a starting point, it can be argued that complexity is that which can't be reduced into

---

<sup>92</sup> Urry considers what complexity might offer as social explanations whereas I remain reserved, careful of complexity becoming mere substitute for convenient 'socio' explanation.

smaller divisions without mutable transformation. Whilst the complex is comprised of many apparent parts, unlike the complicated that can be disassembled and reassembled, the complex entity would be forever changed and the parts also potentially changed as their interactions are disassembled and their contingencies dissolved. A gruesome but poignant allegory that reinforces the dynamic at risk when analysing a complex entity is that dissecting a frog unavoidably leads to a number of body parts or pieces as small as the scalpel and quasi-coroner is able to cut — parts that can never be reassembled. Perhaps Latour's rally will not be a straightforward peeling back of the layers. Dismantling the apparent actant components of a socio-technical system one layer at a time to isolate 'socio-' from 'technical' might sever the dynamic association between numerous parts. That act would in itself render the complex as simply complicated thereby dismantling a functioning entity into numerous bounded components that are too many to comprehend least of all reassemble.

The tension between irreducibility and our need to reduce and describe complexity can be further examined in the work of Nowotny.

Nowotny argues that opposing tendencies to increase complexity and to attempt its reduction is "a contradictory process when encountering, analysing and dealing with complexity" (Nowotny 2005, p.15). She proposes that a co-evolutionary process of science and society is an emergent interface that may be the site to study the two sides of complexity: its continued increase and its reduction (Nowotny 2005, p.29). I am similarly interested in these two sides of complexity to establish a threshold that isolates categories of: complexity and complicated; the irreducible and the reductive; the indescribable and describable. The heaving and circulating site of technology-enabled media established in chapter two and exemplified by the ethnographic place [m.com/do](http://m.com/do) is the emergent interface where I site this study of complexity.

Nowotny situates the distinct notion of increasing complexity within the biological by outlining how complexity has evolved at various levels such as genetic code or transitions of animal societies (Nowotny 2005, p.17). She expands on the transition of animal societies with her example of the evolution of primate to human, with its increased cognitive ability and the benefits of language, as being catalyst for "major cultural and social transitions ... occurring through the invention and diffusion of symbolic technologies" (Nowotny 2005, p.18). Nowotny highlights the significance of symbolic technologies that liberate

consciousness from biological limitations of the human brain to facilitate the linking together of many individual minds that are interdependent and always socialised (Nowotny 2005, p.18). This is what Nowotny considers something of a cultural necessity—the need to communicate and share meaning—a cause for complexity because humans seek to increase complexity to achieve higher efficiency and attempt outcomes we're unable to achieve with the less complex (Nowotny 2005, p.18). However, our intention to create is opposed by a need to describe and interpret complexity as precisely as possible so that we may build complexity avoiding or reducing, for instance, possibly undesirable effects of complex systems. These opposing forces suggest a quandary.

To escape the quandary I propose a counterpoint to complement Nowotny's argument. I propose that the same forces that are catalyst and motivation for complexity could just as readily lead to an entity that is considered simply to be complicated. A complicated entity would be a comprehensive and reducible entity that lacks the dynamics of complexity. The lacking dynamics are those such as the "ability to adapt and co-evolve as they organise through time" (Urry 2005b, p.3) or "a synergistic thing so that we're able to do more than we could imagine or more than we imagined we would" (quote 17) and the absence of these dynamics would leave the complicated as merely a "building block" (IV.46, IV.62, IV.220)<sup>93</sup> that can be dismantled and reassembled.

Suggesting this counterpoint as a complement understates the internal conflict her argument draws attention to. A re-reading of Nowotny's argument with these additional premises suggests the tension between opposing forces that intend to create an irreducible complexity and to deploy reductive practices for precisely describing complexity may now either: (a) fail to create complexity, falling short with an entity that is simply complicated or (b) through reductive intervention dismantle complexity neutralising inherent dynamics in the process and rendering complexity as complicated. I have revised my rationale with the opposing tension of Nowotny combined with this counterpoint to form an alternative model for examining complexity because there is now risk and reward.

We may fail as we strive for efficiency and enablement and, as occurs within a complex system, something else emerges that may just be additional complication. Alternatively, in thinking complexity we may paw and gnaw away at it, the patina of our marks and gestures

---

<sup>93</sup> The abbreviated notation IV Is used to designate in vivo coded phrases from appendix 2.4.

obscuring what was once elegance and the gnawing eroding bonds and eliminating components transforming what was a complex system into mere complication through our careless intervention with our only motivation to reduce so as to describe. Pursuing Latour's rally will not be straightforward at all. A still closer inspection of the language of complexity may extend the basis introduced so far by Urry and Nowotny and prevent careless intervention with complicated or complex formations.

The language of complexity describes something like a life-force ranging from the componentised open system (Cilliers 2005) to the metabolic biological (Capra 2005) to the preternaturally spatial (Thrift 1999, p.32) to the complex relationality of global dis/order (Urry 2005a). The language of Complexity is: open systems, autopoietic and self-generating, not at equilibrium, a metabolic network, anti-reductivist, non-linear, featuring thresholds and bifurcation, patterns, attractors, feedback loops, emergence, instability, and edge of chaos (Urry 2005b; Urry 2005a; Thrift 1999; Capra 2005; Cilliers 2005; Cilliers 1998).

The language of complexity is itself complex and complicated by disciplinary nuances such as those evident in the differences between Cilliers, Capra, Thrift and Urry. The argument taking shape here is not attempting to reconcile those differences or to summarise what has been a burgeoning field "doing metaphorical, theoretical and empirical work within many social and intellectual discourses and practices" (Urry 2005b, p.2). Instead, the intention here is to tease a revised vocabulary out of complexity that will frame and articulate the seemingly irreducible emergence of complicated or complex formations of media and technologies that enable Augmented Reality. This vocabulary is drawn from the consideration of: component entities, emergence across stratified but nonlinear thresholds and an asymmetric dynamic.

First, the emphasis within complexity on irreducible emergence from systems of many components diffuses a sense of individual entities that interact in complex ways. There is a clear sense of components in explanations of complexity, such as: the collective is non-reducible to the components (Urry 2005b, p.5); the components are a process for which the inputs and outputs define the dynamic interactions leading to the emergent behaviour of a complex system of many components (Cilliers 2005); a metabolic network bounded by a membrane which Capra situates within a broader network of organisms in an ecosystem (Capra 2005, p.34).

There is clearly a componentisation to complexity and, as Nowotny suggests, a tension between the irreducibility and a human need to reduce so as to describe. This tension might be side-stepped by a shift in terminology. The term component will now be avoided when referring to complexity because it literally suggests the reducible part of something else. Equally, for this same reason, the term component will still be used when considering the complicated with all its parts. So the term component can be repositioned but something more specific is also required to elaborate what this thing currently referred to as an entity might mean.

With this in mind, an object oriented reading of Latour by Harman will bridge between complexity and the social or technological components that enable Augmented Reality. Harman identifies a polarisation of the object whereby the object exists as an autonomous unit as well as in conjunction with the qualities, relations and events of that object without being reducible to those qualities, relations and events (Harman 2009, p.156). This approach would enable the vast range of human and nonhuman entities to be participants in an assembled and durable whole (Latour 2005, p.70-72) whereby the whole, to switch back to the language of complexity, emerges from the interactions between objects, their qualities, relations and events. The irreducible object-oriented philosophy of Latour via Harman (2009) is a revision of Latour that complements complexity because it allows for an examination of the details without falling prey to the technique of reducing a whole to its components. However, this re-thinking of Latour is perhaps more an invocation of Harman's Object Orientation than a revision of Latour because Latour is motivated elsewhere by Tarde's sociological pursuit of details (Latour 2011, p.9; Latour et al. 2012; Latour & Lepinay 2009) which better aligns with disassembly into complication than with the emergence of complexity.

Perhaps this is a matter of semantics where 'component ' has been exchanged for 'object'. Or perhaps this manoeuvre will help to navigate the re-reading of Nowotny into a tension that I now consider to be a slippery see-saw between complicated and complexity. The intention of this manoeuvre is to respect the irreducible nature of complexity while also establishing an appropriate vocabulary for examining the dynamic components as entities in their own right. This is not about what might be an object amongst the technological



things of Augmented Reality<sup>94</sup> but instead demonstrates an interest in entities that are autonomous and which reveal non-linear functions or interactivity through their qualities, relations and events. Latour tends toward the complicated although an object orientation may tilt an interpretation of Latour toward complexity.<sup>95</sup>

Second, having established a vocabulary for engaging with the irreducibility of complexity or the disassembly of complication to components by way of Latour, the argument now turns to the notion of emergence.

Urry explains that switches occur when a threshold is passed triggering a tipping point that "gives rise to unexpected structures and events whose properties can be different from the underlying elementary laws" (Urry 2005b, p.5). Dramatic change is possible because complex systems have "no natural tendency towards equilibrium" (Urry 2005b, p.6) and are autopoietic, where "the function of each component is to participate in the production or transformation of other components in the network" (Urry 2005b, p.7). These dramatic changes are how components of a system might spontaneously develop collective properties and patterns through their interaction, where emergence is the non-linear consequences that are non-reducible to the components they arose from (Urry 2005b, p.5). It is tempting here to delve into the detail with a Latourian view of these components and this system as an assemblage of interactive objects. Instead, I will continue for now at Urry's level, teasing out a sense of stratification because the ethnographic approach is not to describe the detailed media and technology examples of fragmented global Flows and Scapes. Instead, the argument concerns a theoretical framework for encountering and interpreting specificity amid stratified layers of complication or complexity.<sup>96</sup>

I find in Urry's explanation of complexity a stratification of three levels. The term level is chosen specifically to align with Bhaskar's social stratification (Bhaskar 1986) and Latour's layering of reality into forms and levels (Harman 2009, p.30) but avoiding for now Latour's concept of the black-box (Latour 1999b, p.183) which is an accomplice to his construct of levels (Harman 2009, p.46). The three levels I isolate are that of: multiple components; a component's internal workings; a new emergent collective.

---

<sup>94</sup> An ambivalent position in relation to 'object or thing' will be maintained until chapter four when the difference is considered, starting with a debate between the thickened perspective of Things and the flatness of Objects in section 4.1.

<sup>95</sup> This will test and strain Latour's appreciation of a detailed social and material reality. The informants have instead provided richer accounts of the complexity or complication of a social and technical reality.

<sup>96</sup> Thus reinforcing the tension between descriptive ethnographic agenda and an indescribable subject.

There is no hierarchy to this stratification. An interoperable specificity constructs differing levels of a potentially endless stratification whereby what is emergent at one level may be viewed as the complexity of a component's inner workings when viewed from the perspective of another level. Those levels can be positioned above or positioned alongside if the stratification is plotted on a horizontal axis. This spatial reorientation to a horizontal axis is proposed simply to query a dualist sense of structures stratified from the micro to the macro. There is no necessary linear hierarchy because there is nothing to preclude dynamic relations from occurring between an emergent collective and a component or its inner workings. This is typical of the technological specificity and interoperability of [m.com/do](#) "where their purposes maybe aren't necessarily always aligned but you kind of lash them together for some other outcome that you're aiming for" (quote 23).

This perspective is reinforced by Cilliers' notion of complexity as open systems and Capra's notion of metabolism, whereby, components could potentially interact with many other components to establish multiple routes mediated in different ways (Cilliers 2005, p.257) and these components are a metabolic network which is a flow of energy and production within an ecosystem that is a broader network of organisms (Capra 2005, p.34). To relate this position to my project—an examination of layered digital spaces—requires a re-reading of hierarchy, dynamic systems and emergent patterns to translate this cybernetic image of either a complicated or a complex system of components into something that can potentially be related to technologies, media collections and texts that describe people, place and technology within contemporary Scapes and Flows. A re-reading of Urry, Latour, Cilliers and Capra reinforce the second aspect of my discursive frame which is the notion of a stratified but non-linear system of systems.

The third aspect of my vocabulary will focus on what Cilliers refers to as an asymmetrical structure that is developed, maintained and adapted through the internal dynamic processes of complex systems (Cilliers 2005, p.257). Capra complements this notion of maintenance by applying theories of dissipative structures as an explanation of how the same overall structure is maintained during continued flows and through the changing of components because of the interplay between structure and the dissipative effect of flow and change (Capra 2005, p.37). As previously suggested, emergence occurs when a threshold is passed triggering a bifurcation (Urry 2005b, p.5) and Cilliers' account of dynamic internal processes of complex structures considers the models and structures (Cilliers 2005, p.258) whereas Capra's view of the dynamics of dissipative structures considers the processes of complexity (Capra 2005, p.37).

Each of these perspectives is still somewhat lacking because they ignore a complication often found in complexity: humans. These approaches tend toward the procedural and despite their inherent dynamism, by theoretical association with complexity, they remain simplistic. The third development in my vocabulary will consider internal dynamic processes describing complexity in a way that expects and acknowledges human participation and intervention.

The key to an explanation of asymmetrical structure and internal dynamic processes in a vocabulary befitting human intervention is the notion of a threshold. The threshold is the point where there was marked change between prior and afterwards. There is no requirement that this change occurs instantaneously and so the threshold may be expansive, something like what Turner calls a liminality with a "betwixt and between the positions assigned and arrayed by law, custom, convention, and ceremonial" (Turner 1969, p.95). I would add to Turner's list that positions can also be assigned by technology. Introducing this notion of liminality extends Cilliers' process oriented sense of system components with inputs and outputs and aligns with Capra's sense of flow as gradually transformed by dissipative efforts that consume resources. All of these notions hold a measure of relativity whereby the instantaneous, liminal and dissipative effect on flows are each defined by the other. The passing through a threshold may occur in what would be a small measure of time regarded as an instant yet the dissipative effects of flow could be consciously registered, in the case of an entity capable of consciousness such as a human, which in turn reveals a transitional phase or liminal period when the passing from one instant to another is fleetingly perceived. Consider that moment of assisted GPS inscribed in the data presented in table 1 of section 3.2 and we can reconsider that data as a threshold between human and non-human timelines.

Use of the terminology *process*, *systems* and *metabolic* invokes the language of complexity and initiates a parallel between the model emerging here and notions of complexity suggested by Cilliers and Capra. Their abstract model of a complex arrangement of intentional states complete with component sub-parts and internal thresholds tends to complicate. This model of complexity has a sense of flow with its inherent directionality but written explanations can do a disservice that renders these abstractions as a sense of complicated stasis and that does not present the dynamism expected of complexity. A dynamic can be reintroduced by a conative model (Hilgard 1980; Mayer 2003; Militello et al. 2006; Snow & Jackson 1994) with the different intentional states of motivation and

volition. The tandem arrangement of the constructs of motivation and volition within a "commitment pathway from wishes to wants to intentions to actions" (Snow & Jackson 1994, pp.73-74) is a conative approach that I want to adapt in order to rekindle a sense of vitality in written explanations of complexity and to remind of a human presence amongst the synthetic constructions of technology-enabled media. Conation captures the transformative mental activity that converts a tension between the motivation for a desired state and the eventual commitment and striving to achieve that state as an outcome. The unstable dynamic nature of the conative model, with its commitment pathway comprised of transformative and regulatory processes, represents how mental activity converts and manifests in behaviour.

A conative model is an asymmetrical structure with internal dynamic processes like a complex system divided by thresholds that lead to behaviour, such as the outcome of volitional drives. This asymmetrical structure is irreducible to its causes, unable to be reduced to the switch or threshold between intentional states of motivation and volition. A conative model reinforces the vitality<sup>97</sup> of emergent behaviour that is unable to be reduced from its complexity to the complicated Latourian arrangement of interactions between: actants; their qualities, relations and events; human agents with cognitive and conative abilities.

The deployment of a conative model with internal dynamic structures of motivation and volition revitalises the thesis' discursive frame. Internal forces and dissipative frictions of the conative model potentially act in a way that drags on the dynamic of motivation and volition. The threshold between motivation and volition is a bifurcation that forks to complication when overcome by dissipative forces or forks to a complexity mode as characterised by fluidity and flows leading efficiently to an attractor. Both modes of motivation and volition are potentially complex sub-systems and each operate as an alternate modality of the same entity.

The complexity of conative and cognitive abilities combines with procedural and biological explanations by Cilliers and Capra to reinforce Bennett's vitalism and extend Latour's reductive sociology so that human interactions can be combined with nonhuman interactions in either complicated or complex formations. The extension of complexity with

---

<sup>97</sup> This adoption of conation differs to Bennett who considers conatus via Spinoza in relation to affective bodies (Bennett 2010b, p.21-23).

a conative model recognises that human actants have qualities, relations and events that they initiate and regulate amid complex or complicated nonhuman entities. The vast range of human and nonhuman entities can now be recombined into an assemblage of participants in complicated or complex formations whereby the whole, be it complicated or complex, emerges from the network or assemblage of human and nonhumans and their respective qualities, relations and events.

To summarise, complexity theories have been related to Latour and Bennett (via a conative model) in order to build a discursive frame that isolates entities amongst stratified levels. With this discursive frame a revitalised interoperability is cultivated to allow for critical interpretations of encounters with collectives of humans and nonhumans that operate with and within an indescribable complication or complexity of media and technologies.

At the start of this section I developed a vocabulary for the interpretive framework by examining practitioner explanations of technologies and enfolded their point of view with aspects of complexity theory. The irreducibility of complexity was examined in relation to the dialogue with informants, theoretical perspectives and the input of Bennett and Latour. The distinction made is that complication is reducible, able to be disassembled then reassembled, whereas complexity is irreducible and demonstrates a vitality. The key point from this analysis was the mutable bi-directionality; that complexity may emerge or through analysis we might erode and reduce complexity into complication rendering something greater into mere complication. This section has concluded with a remodelling into an abstract cybernetic conception of complexity by reframing key constructs of 'component', 'emergence', 'dynamic internal process' into a vocabulary that better serves the inclusion of conative human and technology actants within a Latourian sociology or Bennett's brand of vitalism.

This chapter has demonstrated a further departure from the descriptions of encounters introduced in chapter one. Chapter two transformed technology-enablement to technology-entanglement amid an indescribable specificity and recommended a system of systems study of Media. This chapter has pursued this media system of systems approach to support an engagement with the multiplicity of technologies that are infrastructure to the global Flows and Scapes arising from network connectivity. The chapter finishes having established the discursive frame for interpreting the indescribable with input from informants and complexity theory.

Media items such as those from the travel experiences, photo collection and layered elements of Augmented Reality in chapter one can now circulate and heave amid complicated or complex arrangements. Bennett, Mattern, Latour and informants (those contemporary gypsies) have provided a reformulated materialism to better account for this entanglement of technologies between place and information spaces as complicated or complex formations of human and nonhuman objects or things. Chapter four considers further an object orientation to continue this explanation of technology-enablement as an entangled collective of objects or things.



## Chapter 4. Humans & Nonhumans as Collectives of Objects or Things

This chapter examines a question from chapter three: objects or things? The contributions of Bennett and Latour have underpinned the reformulated materialism in chapter three that I have extended via the contribution of informant gypsies and encounters with media and technology-enablers of Augmented Reality. Technology-enablers are infrastructure with both immaterial and material basis — a substrate for matters of fact and matters of concern — and those enablers are hidden in plain sight as advanced constructs that are either complicated or complex. But are they object or thing?

The human oriented and researcher aware approach of Latour and Bennett is sustained in this chapter and complemented by Barad and Bryant who also advocate for collectives of humans and nonhumans. This chapter will consider Latour and Bennett's flattening of stratified human and nonhuman entities into a collective while reconciling that approach with their thickening of entities. The chapter begins with a closer examination of the ontological divide between humans and nonhumans informed by Latour's and Bennett's flattening of thick thingliness and compared to Bryant and Barad's more extreme nonhuman flatness (Barad 2003; Barad 2007; Bryant 2012a; Bryant 2012b). Barad's motivation is to provide a robust account of the materialization of all human and nonhuman bodies and the material-discursive practices by which their differential constitutions are marked (Barad 2003, p.810). Bryant is developing his flat ontology into a revised ontology of machines (Bryant 2012a). Here we seek an appropriate balance, a recalibration, between thickening human and thickened nonhuman by casting the *thick* of Bennett and Latour in a debate against the *flat* of Bryant and Barad.

The debate in section 4.1 is intended to recalibrate the flat or thickness of a human and nonhuman collective of technologies. The debate will test the relevance of thing or object to the complex or complicated formations that augment realities. Section 4.2 continues with an explanation of Augmented Reality as a digital splace of thickened things and in section 4.3 the complex or complicated entanglement of place and information spaces is parsed by way of a tear-down of thickened things.

### **4.1 Thick or Flat and Possibly Entangled**

A debate is staged in this section as an exchange between the opposing perspectives of *thick* or *flat*. Those perspectives are pitted against each other as opponents across an



ontological divide that separates human and nonhuman. This debate is between the respective positions of Latour and Bennett's flattening of thick and Barad and Bryant's extreme flatness. The debate begins with Latour.

Is a Latourian collective thick or flat? Latour is a familiar advocate for the nonhuman 'other' — that other side to the ontological divide that opposes the anthropocentric position of a human point of view. In opposition to Barad and Bryant, he instead considers the assertion that flat is thick arguing from a position diametric to Barad. She argues from an extreme flat, that ontologies pre-exist human subjects and that humans are an eventual end product (Barad 2007, p.22), whereas Latour begins thick by questioning the role of language, representation and other social practices. Latour is a leveller, arguing towards a 'flat' society with stratagems, moves, and turns, that challenge conventional sociologies of macro or micro as evidenced by his complaint that there is no global all-encompassing place where a super-mega-macro-structure would be gathered and summed up (Latour 2005, p.191).

Latour's slogan "localise the global" (Latour 2005, p.192) is applied to this task of flattening. His assertions could be interpreted as strongly affirmative of the proposition that 'thick is flat' with his claim that an advantage of a flattened landscape is that you don't rely on the suspension of entities in a social context (Latour 2005, p.212). Here, we take context to be comparable to thick<sup>98</sup> and so Latour recognises the lasting influence of humans, despite arguing away from a reliance on social context as an explanatory force, thereby retaining a sociological thickness to the collections of human and nonhuman things he studies.

Care must be taken though. Especially when a closer reading of Latour, with consideration of his illustrative case and penchant for flows in either circuits (Latour 2005, p.191) or conduits (Latour 2005, p.212), suggests that he is retaining in his discursive analysis something of an extended inscription of the phenomena as nonhuman. A supermarket is explained by Latour as a place of distributed cognitive abilities found in nonhuman elements such as labels and barcodes, which he abstractly summarises as "competence-building propositions of many small intellectual technologies ... [with] many layers of competence builders" (Latour 2005, pp.211-12). The divide is reopened and stretched by

---

<sup>98</sup> To reinforce this association between context and thick I draw on Geertz' explanation of thick description as the ethnographer's task of pursuing "a multiplicity of complex conceptual structures, many of them superimposed upon or knotted into one another...which he must contrive somehow first to grasp and then to render" (Geertz 1973, p.10).

Latour. A distinction is made between technologies, such as barcodes, as the sum of nonhuman things that are bridged by layers of competence building practices, human practices. Latour is a flattener but equally he is a thickener. So far, Latour maintains the assertion that *flat is thick*.

Latour relies on key allies for his quest against sociological structures that separate human from nonhuman. His second argument in this debate dismisses not just macro but also the micro by attempting to flatten from above *and* from below. The ally Latour relies on (together with Lepinay) to put forward this argument is Tarde. Latour deploys Tarde's notion of *involution* to dissolve all structures from the two realities of macro and micro to one order of reality rendering individual as an equivalent of society (Latour & Lepinay 2009, pp.82-84).

Again Latour's quest is to flatten. He is not just reducing super-mega-macro-structures during his campaign to localise the global. He is furthering his initial argument with what might otherwise be perceived as a duplicitous drive from both macro and micro but courtesy of Tarde, and when situated in this debate for thick or flat, reveals a tactical manoeuvre that attempts to flatten from the opposing perspectives of macro and micro. An inevitable consequence of a flat collective is again evaded by Latour as he invokes via Tarde a curious response resembling a *deus ex machina* when faced with an inevitable flattening of holism and individualism or individual and society (Latour & Lepinay 2009, p.84). Latour responds like Tarde by turning to a greater dynamic: his response is to card chaos into the world (Latour & Lepinay 2009, p.85).

Latour avoids an inevitable flattening that his argument might lead to. Instead, he tends to revel in entanglement and when responding to flattening his reaction is to thicken. Latour's second argument in this debate also asserts that flat is thick but his conclusion recoils from the inevitable end point instead asserting that a flattened collective of human and nonhuman things or objects is thick. Perhaps from afar it might appear flat but from the proximity that Latour inspects his settings, at the divergent ranges of barcodes and supermarkets (Latour 2005, p.211), his sites and scenes are far from a flat landscape despite his many attempts to flatten. Latour's collective is thick.

Does Jane Bennett ascribe thickness to flatness or flatness to thickness? There is an awkwardness at the podium as Latour steps down and Bennett enters the debate.

It is not quite clear if she is with or against the likes of Latour, Barad and Bryant. One awkwardness is that 'thick' is not derived from Bennett's vocabulary. The intersection of Bennett with her debate opponents is that they share a similar, at a general level, intent to flatten the world they describe. A world of human and nonhuman that, in Bennett's words, is "to be flattened, read horizontally as a juxtaposition rather than vertically as a hierarchy of being" (Bennett 2010b, p.9-10). There is little to suggest Bennett's direct kinship with Latour on the matter of 'thick' although we can draw strong comparisons between their materialist projects, as introduced in chapter three, and can look to Bennett's vital materialism, her brand of *vitalism*, with similar expectations as we have for the thick description of nonhuman things advocated by Latour. However, I will not substitute 'vibrant' for 'thick'. Instead I will continue with the respective positions of Latour and Bennett in tandem because, for my purposes, the vitality Bennett attempts to describe is not dissimilar to the thickness encouraged by Latour. Admittedly I do have a preference because the ethnographic sources and observations of this project are better supported by Latour's ethnomethodological engagement with pervasive technology, like GPS and barcodes, than Bennett's phenomenological enriching of worldly detritus: gloves, rats and the like.

The kinship between Bennett and other participants has been reinforced by their shared call to flatten but a certain awkwardness becomes apparent as she reaches the podium. A tension occurs among diverse participants who acknowledge an interest in each other's work yet work in varied domains. One such acknowledgement of shared perspectives is Bennett's comparison between her "polity with more channels of communication between members" and Latour's notion of a vascularised and democratic collective (Bennett 2010b, p.104). Within this intersection between Bennett's 'polity' and Latour's 'collective' is the suggestion of Bennett's kinship to Latour's thickening and the possibility that her call for a flattening does not exclude thick.

With Geertz (1973) ever present at any debate about 'thick' it would be easy to ascribe cultural status to Bennett's mention of channels of communication between members. That approach to thickening would be shouted down by Barad's argument against linguistic and representational predetermination and of course would potentially face Latour's questioning of 'socio-' practices as construction and not as compositional constructor of social reality. Unless, somehow, an anthropomorphic inversion gave voice to the nonhuman

members. Latour and Bennett question the merit of anthropomorphism to project equality onto nonhumans as an attempt to understand what it is to be a thing (Latour 2008, p.8; Bennett 2010b, pp.98-99). I question if such an approach really would give voice to the nonhuman elements of this thesis. The informants spoke of complicated or complex entities but that is their voice and not a distinctive nonhuman voice. At the very least these nonhuman entities can be rendered and seen if not heard as was demonstrated by the visualisation of nonhuman gaze<sup>99</sup> in figure 13 of section 1.2.

As noted, in terms of the present debate, some slight suggestion of Bennett's endorsement of thickness can be found in the intersection between Latour and her shared perspective on polity or collective. Bennett establishes connection to Latour by comparing her call for a "polity with more channels ... between members" (Bennett 2010b, p.104)<sup>100</sup> with Latour's call "to turn this collective into a 'cosmos' instead of an 'unruly shambles' " (Latour 1999b, p.261) which is from his argument to transform science with the inclusion of "lots of controversies, puzzles, risk-taking, imagination, and a 'vascularization' with the rest of the collective as rich and complex as possible" (Latour 1999b, p.259). The intersection is Bennett's attention to Latour's vascularization (Bennett 2010b, p.104). The first connection between Bennett and a notional thickness by proxy of the term vascularization is the situation within which Latour invokes it: a rich and as complex as possible collective, serving as a contact point of controversies, puzzles, risks and imagination between humans and nonhumans. The second connection is a simple literal one in which vascularized is a tissue or structure with vessels (Oxford University Press no date), for instance blood vessels, which combines with Latour's usage of the term to project a rich and complex collective of humans and nonhumans.

Admittedly, Bennett's vital materiality is an interest in vitalism and to borrow from the example given in the literal definition, her interest is in the nutrient carrying blood more than in a direct engagement with the structure of blood vessels which Latour's usage better aligns with. Still, and so I propose, Bennett recognises that a thickened materiality remains irrespective of the 'flattening' applied to the collective. Members are "inextricably enmeshed in a dense network of relations ... a knotted world of vibrant matter" (Bennett 2010b, p.13) where "there is no action that is not conjoint, that does not, in other words,

---

<sup>99</sup> Similar to Bryant's flat ethics suggested later in this section.

<sup>100</sup> Bennett here is emphasising the political goal of vital materialism as communication between members not equality, which is a goal similar to my consideration of interoperability.

immediately become enmeshed in a web of connections" (Bennett 2010b, p.100) and so "human culture is inextricably enmeshed with vibrant, nonhuman agencies" (Bennett 2010b, p.108). Bennett's acknowledgement of enmeshed identities demonstrates a degree of co-operation<sup>101</sup> between her vital materiality and Latour's tendency to 'thicken'. Within this debate, as to whether thick is flat or flat is thick, Bennett asserts that flat is thick.

Bryant begins flat. He does not call for a flattening, instead, he advocates for an object orientation that "place[s] all entities on equal ontological footing ... a single plane of being populated by a variety of different types of objects including humans and societies" (Bryant 2011, p.24). It is hard to compare this proposition with the flattening of Latour and Bennett. Perhaps, as Bryant suggests, I am biased and influenced by a hegemonic epistemology that "condemns philosophy to a thoroughly anthropocentric reference" (Bryant 2011, p.19). Admittedly, I do have trouble 'seeing' as a nonhuman might. However, there is something useful to be found within Bryant's advocacy for 'flat' as he "attempts to think the being of objects unshackled from the gaze of humans in their being for-themselves" (Bryant 2011, p.19). Bryant's attempted thinking of the being of objects resonates with my earlier attempt in section 1.2 to represent in figure 13 the mobility and immobilities of device and data as evidence of objects with a state of being that was independent of their human carrier.

Bryant is not advocating for a transition, a change, a flattening. Bryant is explaining a disjuncture that is a separation or that is "shifting from a dual ontology based on the nature/culture split to collectives, ontology and object-oriented philosophy" (Bryant 2011, p.24). Bryant's disjuncture is a marked difference set in opposition to the "rife anthropocentrism characterising a vertical ontology ... in which humans and culture were treated ... as unilaterally determining the rest of being through their representations, significations, intentions, narratives, and discourses" (Bryant 2012b, p.6-7). What I find in Bryant's advocacy is "a bilateralism of social explanation" (Bryant 2012b, p.7). Bryant's "ambition is to diminish an almost exclusive focus on propositions, representations, norms, signs, narratives, discourses ... to cultivate a greater appreciation for nonhuman actors such as animate and inanimate natural entities, technologies, and such" (Bryant 2011, p.247).

---

<sup>101</sup> A further acknowledgement of cooperation between debate opponents is needed, because Bennett in note 37 of chapter 7 elusively relinquishes her earlier pursuit of agency and connects with Barad's ontologically heterogeneous public creating an opening for distributed agencies (Bennett 2010b, p.108; Bennett 2010b, pp.151-152).

Perhaps he does recognise a stratified human dimension and does realise that flat might be an unexplainable genesis and so a diminishing or flattening of stratification might be required. Except, and here is where Bryant states his difference to Bennett, he aligns himself to a radical flatness.

Bryant identifies Bennett's cultivation of a secular enchantment as an anthropocentric flat ethics: an affective relation with beings of the world that recognises the mysteriousness and vitality resembling life and the complexity and tendency to unexpected behaviour (Bryant 2012b, p.18). Bryant dismisses Bennett's vitalism as an anthropocentric flat ethics that is merely an extension of human sympathies to nonhuman things. He is suspicious "of an ethics based on affect for the same reasons that Kant was suspicious" because "affects seem to be something that you either have or don't have, yet obligations seem to be something that we should have regardless of whether or not we are inclined to have them" (Bryant 2012b, p.18).

The sense of a greater interdependency as evident in Bryant's choice of obligation over affect is something that will serve the developing argument of this thesis. However, his dismissal of an anthropocentric but sympathetic recognition of human and nonhuman relations, as advocated by Bennett and achieved by her flattening via horizontalisation and juxtaposition, neglects an inevitable correlation we can't escape in this project.<sup>102</sup> Bryant is aware of the correlationist conundrum that I face, recalling Meillassoux' analogy that correlation is inescapable "like a bit of dual adhesive tape one attempts to remove from one's finger" (Bryant 2011, p.55) and he sidesteps this conundrum via "Sartre's pre-reflexive cogito which thinks something without simultaneously thinking itself" (Bryant 2011, p.57). Or perhaps this has been too conveniently introduced rhetorically by way of: "what we need here is something like..." (Bryant 2011, p.57). Yes, quite a convenient escape from anthropocentrism by a human. Latour also has a retort to reinforce this scepticism: "we can only be suspicious of a wild extension of speech to things. Humans are still the ones who blather on." (Latour 2004, p.71).

Bryant too hastily sidesteps an anthropocentric inescapability as an overcompensation for anthropocentrism. Possibly his alternate proposal, "a far more radical flat ethics ... referred to as a posthuman flat ethics" (Bryant 2012b, p.20) provides a better escape plan

---

<sup>102</sup> Here I recognise the inherent limitation of researcher driven ethnographic method (as perhaps compared to a computational approach) as essentially being an inescapably human correlationism.

for our anthropocentric self than Sartre. So a continuing aim in this chapter is to reconsider an anti-correlationist point of view that doesn't construct its own escape.

Bryant continues, elaborating on Bogost's decentering of humans by claiming that "nonhuman beings operate ethical machines of their own ... [so] that they pluralize ethical perspectives ... [to] move beyond speciesism ... [and] invite us to adopt the perspective of the nonhumans" (Bryant 2012b, p.20). Again, it is hard to resist increasing disinterest in what is amounting to another too readily applied solution by Bryant. Bryant continues with his elaboration considering Bogost's (2012) *Alien Phenomenology* as one example of a nonhuman perspective humans can adopt and Luhmann's second-order observation both as attempts to "observe how that entity observes or encounters the world" (Bryant 2012b, p.21). In other words, not "how do I experience the computer?", but rather, "how does the computer experience the world?" (Bryant 2012b, p.21). The debate swerves.

The debate has shifted from a confounding 'flat' beginning that is prone to confusion with claims that "all objects equally exist ... [and] that no object can be treated as constructed by another object" (Bryant 2011, p.19). That position competes with Bryant's mereological claim that there can exist "relations between larger-scale objects and smaller-scale objects, defending the autonomy of larger-scale objects from the smaller-scale objects out of which they are built and the autonomy of the smaller-scale objects that compose the larger-scale object" (Bryant 2011, p.31). Flat doesn't seem to be as flat as it is made out to be.

This assertion that began about 'flatness' of objects in parthood relations has evolved into a potentially descriptive approach based on a second-order observation that is not necessarily free of thickeners. One such thickener is an anthropocentric perspective that is attempting to *shift* its point of view to a nonhuman perspective to evade subject, object, culture and representational narratives and discourses but never really escape them. This potentially descriptive account that is a 'shifting' of points of view may be presented as a 'flat' approach but is one that I consider more of a 'flattening' approach. It will be interesting to see how this second-order observation may or may not be thickened with the help of Latour and Bennett.

Bryant's attempt to shift a human point of view to the nonhuman does not mean there are two domains of human and nonhuman. Bryant's distinction of human and nonhuman is not substitute for a dyadic subject/object relation because he, like Bennett, Latour and Barad, recognises that nonhuman and human coexist in collectives and, like Latour, Barad and

Bennett, acknowledges the relationality of these human and nonhuman collectives as entangled (Bryant 2011, p.25). It is here at this notion of 'entanglement' that Barad will take the podium.

Barad also begins flat. Her opponents cast sideways glances that rebound surprise. The anticipation created by mere suggestion of a shared sense of entanglement was perhaps falsely inflated in their minds and at risk of deflation as Barad begins to explain entanglement.

Barad declares, "the notion of discursivity cannot be founded on an inherent distinction between humans and nonhumans" (Barad 2003, p.19). Call it what you will: framework, dualism or divide. Barad has dissolved it with an agential realism that shifts our perspective from that of subject/object to a particular discursivity where humans refer to phenomena and are not independent entities with properties that perpetuate the distinction between human and nonhuman (Barad 2003, p.19).

Barad justifies this extreme flattening as an intention "to understand and take account of the fact that we too are part of the world's differential becoming" (Barad 2007, p.91) because the world is not just a container for us as human (and researcher, I add) to reflectively "acknowledge our situatedness in it" (Barad 2007, p.91). Barad's project is about entanglements and the explanation helps cast her project in the light her opponents anticipated:

To be entangled is not simply to be intertwined with another, as in the joining of separate entities, but to lack an independent self-contained existence. Existence is not an individual affair. Individuals do not pre-exist their interactions; rather, individuals emerge through and as part of their entangled intra-relating. (Barad 2007, p.ix)

The debate is a struggle to follow at this point. These notions require sifting apart. Entanglement is not a union of separate entities. Humans are not independent entities with properties. Humans are indistinct from nonhumans. Individuals emerge from a particular discursivity that Barad explains as intra-relating phenomena.

It seems that Barad might helpfully modify what are augmented realities. The modification is made by reframing a historic term from early computing. The term 'symbiosis' (Licklider 1960; Licklider & Clark 1962) denoted a tight coupling of human and machine to achieve a level of real-time participation by the computer. Symbiosis could be redefined by Barad's



flat perspective to reframe human and computer interactions as an ontological state of being and becoming when individual agencies emerge through and as part of their entangled intra-relating.<sup>103</sup> The symbiosis of technology-enabled agencies that bridge human and nonhuman divides would not be a layered union when reframed by Barad. Agencies emerge discursively for Barad and so technology-enabled agencies would emerge from interactivity. Being augmented is to become entangled under this Barad influenced reconsideration of the symbiosis of human and computer interactions.

Barad's reinforcement of technology-enablement as discursive relations between humans and nonhumans maintains the momentum of this debate. She continues to build upon the claims of her opponents beginning from a point of agreement that the privileging of human should not be at the expense of nonhuman, a point Bryant maintains as a flat outset, an ontological divide, and a destination Latour and Bennett strive to reach with their flattening. Barad's flat is more extreme than an egalitarian union that Bryant suggests. Her opponents anticipation has been rewarded with an entangled intra-relating.

From this contemplation of thick or flat it is unclear if the agreement of Bennett, Latour and Bryant with Barad is a recognition in Barad's project of a flattening or a thickening. Her notion of entanglement is perhaps appealing to both sides. It is neither flat nor thick and quite simply compatible with each respective position. Augmented Reality was never about a user interface and so the ontological premise, of being and becoming by way of intra-relating,<sup>104</sup> informs this examination of the reciprocal relationship between place and information spaces as occurs with Augmented Reality. Yet, the disjunctures between and the mediation of place by information spaces suggests this entangled processual state is thicker than it is flat. This extremely flat perspective of Barad's intra-relating requires further unangling.

Barad's primary ontological unit is phenomena not objects. Phenomena are "the ontological inseparability/entanglement of intra-acting agencies [that are] primitive relations without pre-existing relata" (Barad 2007, p.139). In other words, without pre-existing objects held together by a relationship. A specific intra-action enacts an agential cut effecting a

---

<sup>103</sup> An entanglement of flattened agencies that extends Dourish's notion of coupling as a 'less equal' model of intentionality that "allows us to act with and to act through artifacts" (Dourish 2004, p. 138-9).

<sup>104</sup> Having reached this waypoint the earlier sections of corporeal travel or the image collections and data of chapter one are now cast in an altered frame whereby the intra-action between corporeal mobility and immobilities revealed in the data justify a tendency to explanatory approaches that accommodate thickening.

separation between subject and object and so relate within phenomena emerge through specific intra-actions to determine the boundaries and components of phenomena and to render meaning to particular material articulations of the world (Barad 2007, p.333). These specific material configurings are the material-discursive practices that differentially enact boundaries, properties and meanings (Barad 2007, p.335). For Barad, "intra-actions enact agential separability [which is] the condition of exteriority-within-phenomena" (Barad 2007, p.140). And at this point Barad begins her pursuit not of agentic phenomena but of an exterior that provides for "the possibility of objectivity" (Barad 2007, p.140) as she attempts to equip her increasingly disinterested opponents with "a diffraction apparatus to study these entanglements" (Barad 2007, p.30) in an "exploration [that] will make clear that entanglements are highly specific configurations ... building apparatuses to study them ... [that are] tuned to the particularities of the entanglements at hand" (Barad 2007, pp.73).

At this point the debate will be disengaged as Barad delivers her methodological remarks suggesting how to diffractively grate agentic relations via her notion of an extremely flat entanglement.

These characters of theory, opponents cast in debate, are as large as life but I am sceptical of their constructs because of an awkward confluence as they square off against their targets from individual points of view. Certainly, though, they have united under the same intentions to flatten. Now it is time to cease the debate and return to the immaterial sources and encounters of this project to test their views against the objects or things of this study. A third proposition has been established to further the development of a framework for disentangling media technologies.

The two propositions established so far have been extended by this debate. The first proposition of this thesis is that digital imagery has transformed from visual representation to the specificity of a stratified and expansive construction of interoperable data. This was evident in the presentation of an Atiu image collection as an informational view of place in section 1.2 and reinforced by the tangled account of Augmented Reality componentry such as the tethering to a WIFI router in section 1.3. The second proposition is that there is a meaningful difference between Complication and Complexity that can be applied analytically to reveal the discursive patterns of construction that govern or sustain the atomic building blocks of these advanced constructs. This insight was revealed in

dialogue<sup>105</sup> with those contemporary descendants of the gypsies of Macondo — the inhabitants of m.com/do.

What is advanced by the preceding debate between Latour, Bennett, Bryant and Barad is a third proposition:

**The connected formations of complicated or complex specificity, previously referred to as technology-enablement, can be better accounted for when 'enablement' is replaced by 'entanglement'.**

The third proposition is a restating of technology-enablement as *technology-entanglement*. While I adopt the concept of entanglement from Barad, the developing argument here will retain the inescapable humanity that thickens technology-enablement.

This notion of technology-entanglement requires unpacking and the contribution of Latour and Bennett deserves more attention. A reconsideration of infrastructure in chapter 3 introduced the contribution of Latour and Bennett with their sympathies for collectives of things. The next section builds on their contribution with a consideration of textualisation stratagems for accounting for these thickened lively things that I have recast as the specificity of complex or complicated forms of technology-entanglement.

From section 4.2 follows another sketch in section 4.3 of what is now considered technology-entanglement (no longer technology-enablement). This sketch will attempt an alternative form of narrative established by propositions one to three to account for this tangled notion of Augmented Reality. The sketch will continue with a disassembly of the assemblage that enables Augmented Reality and/or entangles reality. The sketch in section 4.3 is a tear-down.

## **4.2 Digital Splaces Inhabited by Thickened Things**

This section begins by considering how a cultivated positionality, a point of view as researcher, could help to overcome Bennett's (2010) challenge of discernment. The momentum of the debate from section 4.1 is continued by attempting a *flattening* by way of *thickening*.

Bennett refers to the thingly self as the case where "the active power of things is

---

<sup>105</sup> As reminder, qualitative analysis of interview material from informants is provided in appendix 2.0.

complicated by the fact that the ethnographer of the material agency ... is itself a thing-power with thing-power" (Bennett 2010a). I can relate to this concern having previously identified a similar state as the immersive self (Fleming & Nicholson, 2013). Bennett suggests one way to overcome blocks to discernment brought about by the thingly self is to "work on our subject-predicate grammar that diligently assigns activities to subjects and passivity to objects" as a means to try overcome "a philosophical cannon whose vocabulary is based on the presumption that man is the measure of all things" (Bennett 2010a). A coherent vocabulary like Bennett advocates is too ambitious an intention for this thesis with competing voices of researcher, informants, theorists and possibly the things themselves should they achieve Bryant's objective of a flat ethics and find their voice in this textualisation. Instead I will focus on thickening descriptions with the help of intertextuality. Motivated to exceed Bennett's observations of things, I develop thickened descriptions and a richer lexicon of thing-power as it might relate to internet technologies.

The reckless imagination of Buendía and relocating of this project to the ethnographic place of *m.com/do* are literary freedoms to escape the symbiotic bond of user and interface. What I am attempting to cultivate is a mindset to be deployed when encountering the objects or things that are technology enablers of information spaces and place. I am not attempting to disavow past or potential knowledge in favour of a naiveté that claims some innocent truthfulness. Instead, I am establishing that an atypical approach to the descriptive material is required. This atypical approach is seeking rifts that lead beyond mere interface between humans and technologies. I am cultivating a knowingly naive approach.

Bennett offers encouragement for what I cultivate by way of her attempts to develop "a certain willingness to appear naive or foolish ... to theorise events as encounters between ontologically diverse actants ... a cultivated, patient, sensory attentiveness to nonhuman forces operating outside and inside the human body" (Bennett 2010b, xiii-xiv). Bennett applies her method to the pursuit of "a vitality intrinsic to materiality" that she refers to as vibrant matter (Bennett 2010b, xiii). I apply this knowingly naive approach during the pursuit of a vital materiality of technology.<sup>106</sup>

Naiveté is an impossibility and I will avoid suggestion of a naive realism. Here I rely on

---

<sup>106</sup> There have been signs of this already, such as the deliberate inclusion of handwritten sticker as an enabler when reviewing the WIFI router considered during the analysis of Darknet in section 3.1.

naiveté as a mindfulness, ironically, because it would be advantageous to engage with technology demonstrating an unaffected simplicity even if that state is but intellectual ploy to complement tendencies of demystification and formulation that Bennett grapples with—tendencies she resists (Bennett 2010b, p.xv). I seek to cultivate a naive mindset explained as an unaffected simplicity. This is not a naiveté that is accepting of direct sensory perception as in naive-realism nor a naivety that presents itself as unknowing or simplicity. This cultivated naiveté is reminiscent of Heim's virtual realism which acknowledges layers of reality that are bound by complex association by computers and his 'technanalysis' that is "a critical strategy for describing specific technologies, a style of thinking appropriate for walking the fissures of a culture in transition" (Heim 1998, p.46).

The key trait of my approach is an 'unaffected simplicity' where relations are revealed through the demonstrated complexity or complication of human and nonhuman collectives that form technological and informationalised composites. This naiveté will attend to the simplicity as evident in complicated or complex arrangements of technologies without assuming a transcendence whereby the complicated or complex achieves a vitality because the presumed force exceeds the recognisable capability of human or nonhuman actants to act.

Perhaps my intent remains obtuse. Seeking out vitality in complexity or complication from a naive standpoint deserves more explanation of what is meant by *unaffected simplicity*. The key terms will each be examined followed by an explanation of their combined meaning.

First, *unaffected* is literally taken as free from affection. Affection is a disposition of state of being influenced or acted upon that can be either negative, in the case of impairment when Buendía was hampered by his fascination, or positive, in the case of being impressed or moved emotionally. In contrast to this interpretation of affection, unaffected is seen as a form of neutrality or at least a counterbalancing of either positive or negative affection achieved by the ability to swing one way or the other to offset the bias. This pendulous momentum is a ploy and a potentially more reliable technique than an unattainable degree of neutrality. This sense of an unaffected naiveté has already been demonstrated during encounters with photo collection or assisted GPS where I resist the negativity of impairment or recklessness of imagination that Buendía is prone to.

Second, the term *simplicity* contains a contradiction in the case of abstracted and

encapsulated black-box technologies and media system of systems. The term simplicity can refer to either freedom from complexity and intricacy, or the freedom from guile or deceit. Both conditions are improbable in the case of technologised actants. The social reliance on automagic is a duplicitous example where two parties concede to a deceitful simplification as a freedom from the complexity at hand. This ruse has no place in my cultivated state of 'unaffected simplicity'. Instead, intricacies are accepted as simplicity in the sense that any intricacies are a normality that should be expected and so when present will not be concealed by social construction or encapsulation as happens in the case of automagic or when blackboxing complex and complicated technologies.

The phrase 'unaffected simplicity' now represents pendulous thinking to overcome bias introduced by actants intra-acting amongst technological and informationalised intricacies and complexities. This notion of unaffected simplicity is introduced to counterintuitively engage with complication or complexity but it is important to acknowledge that it is not naïveté. It is a cultivated naïveté intended as interpretive mindset<sup>107</sup> to seek out rifts that lead beyond interfaces between humans and those nonhuman things that are technologies. This cultivated naïveté is a mindset for seeking out the ontological state of those things or objects be they flat, thick or otherwise entangled.

I will next attempt to sense, think and briefly narrate a different encounter between subject, object and thickened things. I will extend the previously outlined sensitivities of Latour and Bennett in my examination of a network technology. I will examine a distributed technology-entanglement instead of a haphazard collection or serendipitous experience of things.

There are things everywhere. The things I refer to are the items hidden in plain sight, and by extending Latour's perspective, I can see how these things play a role in establishing a particular form of materialism to help navigate seamlessly—with an easy interchangeability— between the realisms of place and information spaces. Latour (2007) distinguishes an ideal and a material definition of matter by contrasting the description of a technology with the technology. The description Latour refers to is "the reproduction of the parts through geometry" (Latour 2007, p.140) which is a technical drawing showing the

---

<sup>107</sup> This interpretive mindset is different to Michael's idiotic methodology in that he considers the waywardness of objects as the "emergence of idiotic objects [which] occasions a radical rethinking of the events in which they emerged" (Michael 2012, p.171).

exploded view of all the parts that "allows the engineers to draw and know the parts, while the parts themselves go their own ways and follow, so to speak, their own directions" (Latour 2007, p.140). The idealist definition of matter confuses the two resulting in a 'thin' description of objects and the materialist definition of matter maintains the distinction resulting in a thick description: a thick-thing.

Alder's (1998; 2007) notion of a thick-thing is an intermediary waypoint to the reformulation of materialism and another possible bridge from Latour's and Bennett's respective interpretations of things to my brand of fluid inter-operating with technology-entanglement. Alder's thick-thing provides a rhetorical approach that centres description on things which are those things suspended in relations that constitute a technology-enabled sense of place. The notion of thick-things extends beyond what is proximal and for my purposes can extend what is a site and scene potentially recasting images from Augmented Reality as a thick-thing suspended in relation to sites, scenes and technological things.

The thick-thing is not the part nor a singular whole. This type of thing is independent of any particular subject-object subordinate relationship and is able to follow its own direction. Another approach to a similar dissolution of the subject-object co-dependency is an approach that is an object oriented ontology after Bryant and that is considered in the next section. For now I choose to extend Latour's and Bennett's notions of things because their perspectives initiate a suitable basis for a materialism *and* immaterialism of matter and information.

#### *Encounter XI A Thickened Description of a Thing*

Things are everywhere and if you're not walking around them or tripping over them, you're stumbling into them by encountering the social disturbance your interactions create. Another brief account informed by my professional role will demonstrate how those things found everywhere are thickened.

I have been using vitalism and thickness as heuristics for a while now. I didn't realise until the coincidence of reading Bennett and Latour during the same week I was evaluating a Software as a Service (SaaS) product named MailChimp.

Health and pedigree are meaningful. Health is a summation of activity and pedigree is the

depth of history and co-dependencies; a sensitivity to the active roles of the people, organisations, and technologies that have created and support the product. Health is intuitively a near-relative of vitalism and pedigree a sort-of thick description.

The SaaS product MailChimp is actively developed with a suite of subsidiary products, examples and documentation. Their integration fund also sponsors development and maintenance by ThinkShout of the MailChimp module for the Content Management System Drupal which has an installation base of 15,237 sites and up to date code checked-in as recently as 1 day ago by drupal.org user 'gcb' at the time of my final review on 10 April 2014 (Drupal no date). Vast amounts of documentation are available that describe much more but this scant sketch is a sufficient check of pulse and genealogy. MailChimp is presently alive and well with a depth of activity as evidenced by support for interoperable sub-systems such as the Drupal module. Version control statistics serve as an indicator of vitalism when descriptions of things are thickened.

Software is an ecosystem that breeds. Software is an ecosystem of subject-object connecting and disconnecting relations simply understood from a personal and practice informed standpoint as an aggregate loosely bundled as a 'something' and critically unpacked by this thesis as 'some-things' with health and pedigree. Here, Bennett and Latour's materialist pursuit of vitalism and thickness has been extended to decipher what the indescribable some-things and their aggregates are.

\* \* \* \*

Latour's rally to reassemble rather than reduce to the social encourages that I press on. The social disturbances encountered as I trip over those things in plain sight do not constitute an explanation of those interactions. That brief account of MailChimp to describe software as an ecosystem that breeds was an interlude that converts the discursive frame advanced in this chapter into renewed sensory powers for testing this cultivated naiveté against everyday encounters. The three propositions have established that media representations are transformed by technology-enablement to a realm of specificity (in section 2.3) that is an advanced construct which is either complicated or complex (in chapter three) that can be better accounted for as technology-entanglement (in section 4.1). Those propositions are reinforced by the theoretical examination in chapters three and four and supported by material from encounters described in chapters one to three to form a framework that this



discursive frame operates within.

Latour encouraged by analysis the prodigious extension of the number of parts multiplied by the assembling principles that gather and unite them as a whole to attempt a census of necessary parts and processes of coalescence (2007, p.140). In that brief account, of software as an ecosystem of connecting and disconnecting relations, my enriched description of observable (to me) parts is quickly overwhelmed as they translate into an aggregate with a different vocabulary: code updates and contributing users transforms into pulse and genealogy. Latour is encouraging of an account, along with Alder, that acknowledges and attempts to represent with richness the diverse set of actants and their multiple divergent interests in a way that is analogous to Geertz' thick description, as "sort of piled-up structures of inference and implication" (Geertz 1973, pp.6-7), so as to represent a thickness of things (Adler 2007, p.2; Latour 2007, p.140). Latour looks to the fiction of Richard Powers for an enriched representation and perhaps Latour and Powers might combine to extend my account, that briefest of sketches about software that breeds.

Latour considers how the fictional work of Richard Powers usefully presents a thickened realist description of technologies. Latour considers the role of rhetoric and textual stratagems for expression of what I identify as an indescribability.

Latour's interest in Powers is a reminder about multiple realisms that are possibly active in this study of Augmented Reality. Latour's interest in Powers is in the use of language that is the "subjacent layer [that] is still a plain English description" (Latour 2008, p.12). The topic of their attention is the development of a virtual reality facility called the Cavern. Latour looks to Powers to find a tool box of "resources for giving our own descriptions the kind of grasp on reality" (Latour 2008, p.2). I too look for a descriptive tool box that will help distinguish between multifaceted realisms, between Latour's realisms that are constructed matters of fact and matters of concern. The subjacent layer I describe is a technology-entanglement that is both construction and experience but what of a multifaceted realism that is augmented?

There is a slippery distinction between fact and fiction at work and Latour selects Powers for his ability to bring either fact or fiction to bear on the realism(s) that are constructed from "layers after layers, competence after competence" (Latour 2008, p.12). And, what of a different type of factual or fictional representation, another layered technology-enabled encounter with realisms where humans and these nonhuman caverns become portable and the illumination of their substrates is as much an ever present surrounding as it is a

construction? What of an augmented reality: an augmentation that combines presence with the remote through connectivity in an entangled hybridity of human, nonhuman and spatialities? Are there similarities to Powers' Cavern despite Augmented Reality occurring as an exterior to the metaphorical interior of the cave? The same consideration Latour asks of a technology-enabled reality via Powers' Cavern could be asked as a question of augmentation: does it provide more reality or less? The layered imagery and user interface of Augmented Reality may provide *more information* in the form of visual and textual data but the expansiveness of a human constructed technology-entanglement, I maintain, is an enabler of *more realities* not less.

The metaphor of a cavern, an illusionary metaphor, evokes a period of close community through family ties bound by habitat and survival. The reference to a cavern metaphor suggests a preternatural equivalent to a time of subsistence without (dis)advantages of codified and transferred histories. The metaphorical cavern is a darkness from which gestures and markings begin to record and the world is illuminated, which in Powers' case is an illumination by screens. The parallel with a cave existence is minimal, only by name, but for our purposes this comparison is striking. The comparison is between spatialities of earthen surrounds illuminated by fire and spatialities of artificial substrates and deliberate darkness illuminated by energies provided by electricity. The energy is plural because there is light on the wall, current exchange, and an ever-present concern of heat not produced by friction or flame and for heat that is damaging. There is heat produced and a concern for management of that heat so that thermal by-product does not negatively impact on the traditional materialities that produce the new formulation of immaterialities thus fusing and destroying the material componentry of technology-entanglement. Simply put: this concern is about over-heating.

By what assistance are these sites and scenes augmented? The image of a cavern as earthen or facility for virtual encounters is imaginable but the vast materiality of these things is not. Powers' writing transforms familiar stuff into the unfamiliar things of this cavern. He writes of beady rat eyes and creature droppings. Powers rhetorical technique is one of the many x-morphic transformative metaphors Latour considers essential for carrying out his project, "the use of transformed morphisms that thus renew our understanding of what it is to be a thing" (Latour 2008, p.8). Powers' transformative x-morphic method in the following passage is zoo-morphic:

Gloom unfolded to her adjusting eyes. Stray, chaotic caches of chrome appeared

on all sides of her, evil little Duchamp originals. Banks of lights blinked out of the pitch, like the beady red eyes of robotic rats. Connectors and controllers littered the floor, the metallic droppings of those circuit creatures. She bobbed in a sea of digital serpents. VCRs on steroids, microwaves pumped up on growth hormone murmured at her. She wanted to hack at the silicon swarms—Michael driving off the fallen angels. Who had let these devices into the world? Who could possibly hope to track their various agendas? Adie, whose eidetic eye once re-created the putti, garlands, and cornucopias of a garish Baroque communion rail from memory, could not have sketched these consoles, even as they hissed at her.

(Powers 2001, p.11)

The paraphernalia of our scenes renders assistance and provides technology-enablement but there is an inaccessibility to these items strewn in plain sight. The beady red eyes, metallic droppings and silicon swarms are devices in our world with agendas to track or matters of concern to trace. It is implied by Latour's attention that tracing these matters of concern with similar attention as Powers to the realisms of matters of fact and matters of concern will suggest something about what it means to exist when so much existence depends on things (Latour 2008, p.3).

These items do not deserve to be merely adopted as science fiction and instead are considered as Bennett suggests: the adoption of a touch of anthropomorphism to catalyse a sensibility for finding a world of "variously composed materialities that form confederations" (Bennett 2010b, p.99). Latour is potentially in agreement with Bennett as he revels in Powers ability "...to provide more reality, not less" celebrates the "impression of a more realistic realism" and is buoyed with "an incredible confidence in the capacity of description ...[that] every *thing* can be carried in language" (Latour 2008, p.12).

Latour is confident the indescribable is describable, perhaps as an x-morphic account. Here again is another association between Latour and Bennett as they adopt x-morphic techniques to displace a predominantly Human perspective. I, however, doubt that an x-morphic account will support this project.

My questioning of an x-morphic account is because this textual technique risks a sleight of hand ascribing vitality and the ontological status of an entity to some collective of things or objects by rhetorical means. The technique might have merit, capturing and shifting attention to those invisible objects and things strewn in plain sight in sites and scenes as colliding realisms that would otherwise be separated categorically as virtual and real

despite the materialism and dynamism of their associated actants. An x-morphic technique perhaps has merit but I will continue<sup>108</sup> with my pursuit of the vitality that these complicated or complex arrangements of things or objects demonstrate as they combine, thickened and entangled, into collectives of sites and scene. Instead I will persevere with an alternate 'placing' of this project in the fictional setting of m.com/do — a nonhuman address that is human readable — as my textual means of displacing humans to a place that is founded on shared terms and cohabitated with nonhumans.

I will attempt in the next section an iPhone tear-down as a demonstration of a thickened description of things. This textualisation of thick-things is comparable to Latour's example of a technical drawing of exploded parts in isometric perspective (Latour 2007). What is tested by this tear-down is whether that textual technique can imbue that mobile phone, a device I hold in the palm of my hand, with sufficient relationships to render it as a flat object or thick-thing. This section has pressed further with a thick perspective as advanced in the debate by Bennett and Latour. The next section maintains attention to Bryant's flat ethics, Barad's intra-action and Bogost's phenomenology by transforming Latour's recasting of a technical drawing as analytical device into an object oriented description: an ontography.

### **4.3 Parsing Technology-entanglement for a Flat Object or Thick Thing**

This section begins with a review of progress before the tear-down parsing of objects and things. The technology-entanglement established via dialogue with informant gypsies and the accumulating encounters of this thesis is then parsed by interpretive tear-down to reconsider the thickened things and flat objects from sections 4.1 and 4.2.

Augmented Reality is a real world view augmented by computer generated material. Said another way: Augmented Reality is a view of reality that is added to by computing. And to focus further on the elements implied by these statements, there are: two realities, a sightline, a combinatory effect (that of augmentation) and computing. The accumulating criticality of this thesis—the emic distinctions between complicated and complexity plus the flat and flattening efforts of Latour, Bennett, Barad and Bryant combined with a cultivated naiveté—indicates that the sightline is unlikely to be a singular point of view. The sightline

---

<sup>108</sup> Recall the consideration earlier in this chapter of Latour's and Bennett's x-morphic technique to decentre anthropocentrism. It is not dismissed but is not pursued.

is instead any range of perspectives within any number of thickened and entangled assemblages of a human and nonhuman reformulated materialism. This sightline that is thickened and entangled by augmentation holds multiple points of view. Augmented Reality is the augmentation of points of view, be they the immediate observation of user at their user interface or the remote and possibly historic influence of code substrates. That explanation unpacks the vastness of computing into only two aspects of code and user interface to serve here as examples of how thickened and entangled sites may be revealed as complicated or complex scenes.

This project has acquired a range of source material from a series of encounters. Scenes have been enriched and vitalised by a multiplicity of augmented points of view. During the course of this project there was a geo-locating fracas by humans when it was discovered that smartphones, those devices comprised of human and nonhuman things, stored and transmitted geospatial data. Encounters have so far been introduced in chapters one to three as accounts of informationalised travel, a visualisation of scene distributions, an account of Augmented Reality in Atiu, a virtual journey, an aesthetic of landmark photography, an analysis of assisted GPS, an alternative inter-network named Darknet. Recall the multiple points of view introduced when augmented on Atiu via Panoramio user neuseeland77 in chapter one or the aggregation of photographic and narrated points of view by Vionnet and Odell in chapter two. Reconsider those multiple points of view as thickened and entangled sites and scenes of technology-enablement.

This project began with the selection of Augmented Reality as a use-case of internet technologies because of the inflection of media technologies back into spatial and visual orientations. The information spaces migrate to place forming spaces. Chapters one and two framed this cyclic movement of movements, this informationalised mobility between place and information spaces and then returning from information spaces to spaces, conflating all into a digital splace. The inflection of those broad processual relationships between places and information spaces extends the rift that was descended first in section 1.2 with an informational view of Atiu that revealed the im/mobilities of data and a technology-enabled gaze. In this section the technology-enabled sites and scenes of chapter one are transcended with an alternative account of technology-entangled sites and scenes as occurs with the use of Augmented Reality technologies. The transformation is from a site set down at and a scene observed to a reality of augmented points of view. The narrative chain of visitation and place making has become fully interoperable with a global-

scale distribution of component technologies.

But are they flat? Do they demonstrate the equality of human and nonhuman actants advocated by Bryant? How could they be flat despite the efforts to flatten assemblages as entangled and thickened as space and place, as the encounters of this thesis have demonstrated for the computationally assisted geospatial media and technology of Augmented Reality?

Each item has its own connection. Each piece fits together like puzzle pieces but that's not to say these are pieces of the same puzzle. The puzzle is whether this disparate assemblage of things and objects gathered under the same terms from primary and secondary sources that were designed research encounters and project events spanning place and information spaces has a well-defined singular boundary like the familiar structure of a jigsaw puzzle. Except, there is no homogenising device such as the straight edge of a border to frame this puzzle. The things and objects are entangled. There is no convenient bounding of any disparate assemblage of things and objects by labelling the human and nonhuman interactions a socio-technical system. Instead the pieces combine by connecting in their own parthood while also connecting to other parts as things or objects thus forming the illusory form of a 'whole' but without border their form is a greater 'whole' than our human capacity can recognise. That illusory form is technology-entanglement.

What follows is an outline of items without presumption that they form a single puzzle bounded by a homogenising frame. There is no deliberate attempt to connect each piece so that the completed puzzle resembles the original image of particular technological solution or media representation. Instead, these puzzle pieces are allowed to sprawl without assumed border and with indescribable negative space left between assembled parts. The reformulated materialism inclusive of invisible infrastructural components revealed in chapter three encourages that both faces and the substrate of the puzzle pieces are considered during the following interpretive parsing of technology-entanglement.

The parsing will begin with an inventorising of enablers presented as an outline to lead in to the interpretive parsing that I refer to as a tear-down. The intent and nature of this representation deserves explanation before beginning the outline. An outline is similar to a list with inherent order and/or structure such as a hierarchical depth. An outline is a simple representation easily communicated to the reader. The following listing of objects and

things is far from a simple list of items. An outline is a human oversimplification and one that does not relay the analytical technique that renders the outline. Instead this outline is more appropriately considered a 'tear-down' similar to iFixit's instructional teardowns of devices (iFixit 2009) except that a multiplicity of technologies derived or having originated from not just a single device but multiple devices, systems, institutions or media are torn apart. This interpretive tear-down unpacks items into an expanded representation similar to a device tear-down as shown in figure 25 below and similar to exploded diagrammatic views. Those exploded views are prized by Latour because "geometry is what allows engineers to draw and know the parts, while the parts themselves go their own ways and follow, so to speak, their own directions" (Latour 2007, p.140). Latour offers an insight this project can leverage:

...we are now faced with two different definitions of 'matter': one (the idealist one) in which the reproduction of the parts through geometry is confused with the reproduction of the parts themselves, and another in which those two pathways are clearly distinct. The first gives way to objects, the description of which is always thin; the second gives way to things, which are the topics ... of thick description.  
(Latour 2007, p.140)

Latour's distinctions between the thick and thin descriptions of parts or their reproduction can be extended to provide another rift for this project to exploit. The rift is a method for the thick description of parts that accesses layers beyond the interfacing between human and nonhuman technologies and on-screen media representations. The aim of this approach is to unpack and analyse items loosely associated by encounter or somehow interoperable with each other while recognising that parts can also go their own way and follow their own directions. The purpose of this encounter is to develop the discursive frames of preceding sections into an interpretive fluency when encountering technology-entangled thick-things or flat objects.

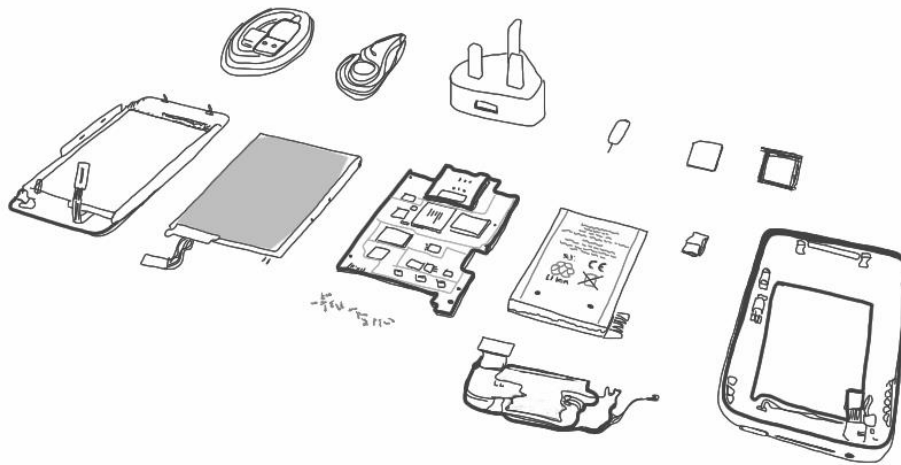


Figure 25 - Results of an iPhone Tear-down

Assembled on my theoretical workbench and ready for attention are a variety of acquired objects or things, some thick and some thin. These have been unpacked from a collection of items gathered under the rubric of fieldnotes during encounters with the technology-enabled practices and media spaces of information spaces and the spatiality and events of place. Assembled, after having been acquired during project encounters is the evidence of interoperability between technology, media and people that span multiple digital splaces of information, media, place and technology. Let the tear-down begin.

These encounters accumulate and combine in this thesis. Their explanations are extended by Latour, Bennett and our gypsy informants to provide an account of distributed agencies spanning between information spaces and place as thickened descriptions of objects and things. Technology-entanglement has been explained throughout this thesis to reveal the fragmented multiplicity of media and technologies of Augmented Reality. These encounters, to borrow Bennett's vocabulary, reveal an agentic assemblage within affective relations that my intra-relations (after Barad) are from and a part of. The objects, to inflect Bryant into this summation, extend beyond the frames of their apparent spatialities, exceeding their technological boundaries or media-scap'esque quadrants that form categorical habitats to conveniently occupy instead becoming an emergent network of



associations.<sup>109</sup> Perhaps this sense of beyond human scope is an indicator of a withdrawn quality forever receding from a human's reach. Except these objects can also be read as things with an intimate scale (such as an iPhone device or an image on Panoramio from an individual user's travel experiences) that deceptively exceeds the human scale of a user interaction despite it also fitting in our hand or responding to our click.

Perhaps the following tear-down will reveal a flat object-ness that I presently struggle to recognise. Perhaps the following tear-down might also confirm a withdrawal, whereby complication and complexity become more of a shroud to something else, some Otherness, some object-ness that is withdrawn and free from entanglement, aiding withdrawal and never an ontological state in itself. Harman informs this consideration of flat object or thick-thing with his attention to the withdrawing from relations by objects:

Just as Latour teaches, there are countless actors of different sizes and types, constantly dueling and negotiating with each other. But objects are not defined by their relations: instead they are what enter into relations in the first place, and their allies can never fully mine their ores. In Heideggerian terms, objects enter relations but withdraw from them as well; objects are built of components, but exceed those components. Things exist not in relation but in a strange sort of vacuum from which they only partly emerge into relation. Objects are purely actual, not potential. Yet this actuality is not defined by a set of relations with other things.  
(Harman 2009, p.132)

At stake in the following theoretically imbued description — this ontography, this tear-down — is whether the vitality of complication or complexity is preserved: its dynamic agentic assemblage recognisable amid the entangled reality of these objects or thick-things. Perhaps if Vinge's singularity had occurred I might more readily recognise the autonomy of purely actual objects as withdrawn<sup>110</sup> and not defined by relations with things. I admit a continuing bias toward thing over object, unswayed by the preceding debate, because of the encounters with the tangled human and nonhuman components and relations of Augmented Reality presented so far in this thesis (see also figure 26 and Item #2 below). I acknowledge and retain an awareness of withdrawn objects as an alternative to technology-entangled thick-things, especially with the imaginable possibility of a

---

<sup>109</sup> Recall those interoperable media and technologies represented in figure 3 and appendix 3.

<sup>110</sup> Contributors to Harman's withdrawn object are Bryant who argues that objects are withdrawn from all relations (Bryant 2011, p.26) and Morton who explains objects as withdrawn from access in an assemblage of relations (Morton 2011, p.150) or as a mesh that "as a system is not a thing, not an object, but a strange infinite network without inside or outside" (Morton 2010, p.267).

technological singularity, and I retain a scepticism of humans adopting an object orientation as I encounter items of media and technologies from a very human hand-held point of view. With an awareness of withdrawn objects and established bias to technology-entangled thickened things, the following interpretive tear-down can now begin.

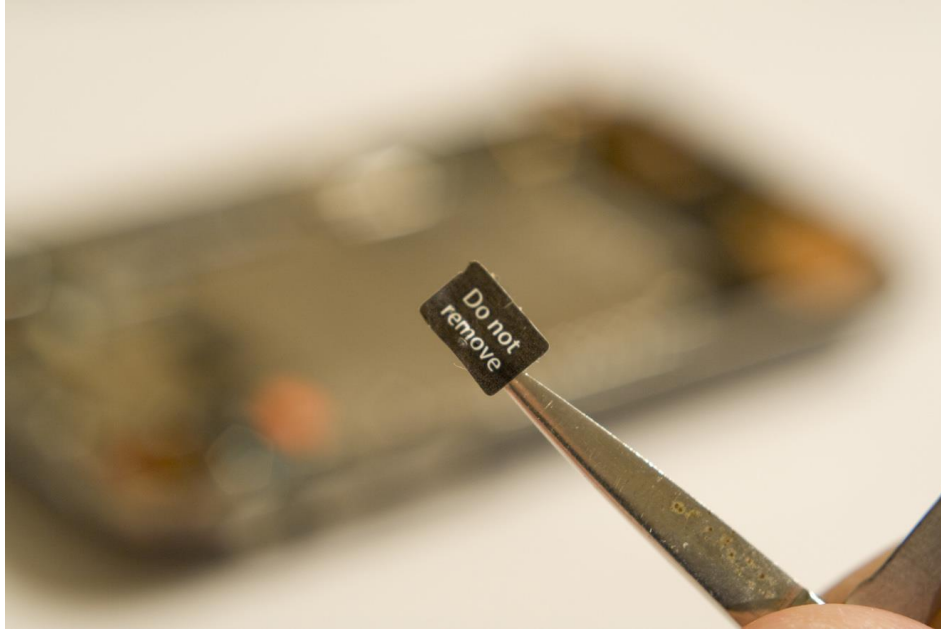


Figure 26 - A Very Human Component of a Thick-thing

Assembled in support of the interpretation of Augmented Reality that follows as a tear-down are:

**Item # 1:**

An iPhone device in a plastic moulded protective casing and held at iOS version 4.3, frozen, since 25 March 2011. The material parts of which are illustrated in figure 25 as the results of item #2 (next).

**Item # 2:**

A 'knowing' account of disassembly to thicken Item #1. A teardown of the iPhone 3GS complete with backstory to accompany the fabled 'Do not remove' sticker from step 9 (iFixit 2009) as seen in figure 26 above.

**Item # 3:**

The data file of the CellLocation and WifiLocation tables from the consolidated database and once secretly located in an iTunes Library, but relocated by forensic device analysis (Neal 2011) and shared software (Warden & Allan no date) which prompted the patch 4.3.3 (Apple Inc. 2011) to encrypt that cache of data whilst imaginations prompted a civil lawsuit (see Item #4). This single item entangles as it thickens escalating to legal reaction.

**Item # 4:**

A legal case file for a class-action against Apple in the United States District Court Northern District of California San Jose Division, case number 11-MD-02250-LHK (Kamber & Stampley 2013).

**Item # 5:**

A hand delivered explanation to Representatives Markey and Barton of Apple Inc.'s privacy policy and location based services (Sewell 2010).

**Item # 6:**

A spatial experiment comparing GPS accuracy between three devices coexisting nearby at the same time to reveal the extent of an inaccuracy in the iPhone receiver. As shown in figure 27, the iPhone GPS measurement of 18 50 36S 159 47 28W was an informational relocation to the property next door.

The items above, be they Latourian network of actants or Bennett's agentic assemblage or some autopoietic arrangement reconstituted by Bryant as an object, have been acquired because they have congregated around the technologies of Augmented Reality. The congregation has formed a media collective where collective is inclusive of nonhuman relations just as Latour, Bennett, Bryant and Barad argued in the debate in section 4.1. This collective is parsed by analyses of complication or complexity to reveal or revel in the merits of a thickened reformulated materialism introduced in chapter three or a flat Object Orientation suggested as an alternative in preceding sections of this chapter. Let the tear-down begin. Let's parse.

One by one, let's parse. The items above began in a human-centric and self-centred order. The list begins with an iPhone device that fits in my hand, is my iPhone, and spans technological and spatial quadrants. Next on the list, with absolute human centrality, the black-box is deconstructed into a number of pieces as I follow the tear-down instructions from #1 in parallel to this analytical tear-down. The spatial occupation of this device is expanded and the technological compression revealed as parts that in their individuality reveal an entanglement: in step 11 the main logic board has a lot packed onto it, so much so a counterpart conducts a chip analysis to produce a component diagram. The sparse narrative reveals a lot with those words: packed in, chip analysis, component diagram. The device then gets more personal with a record tracing my movements, or so the class action in #4 fears and the hand delivered explanation in #5 dissuades, meanwhile my spatial experiment from #6 reveals I escaped the surveillance whilst next door or so the inaccurate

geospatial data of my iOS device suggests in figure 27<sup>111</sup> below.



Figure 27 - Mis-placed iOS Surveillance Due to Device Inaccuracy

These technologies are complicated and our informant gypsies remind that there are "definitely some pretty broad collections of things that you might describe as a single technology" (quote 20). Technologies might also be complex, "perhaps the workings of it are sort of complex beyond what simple inspection could reveal" (quote 49). Complication is a closed non-adaptive system whereas complexity interacts with its environ, is contingent, historical and irreducible (Cilliers 1998; Cilliers 2005; Urry 2005b; Capra 2005; Nowotny 2005). Let's parse.

I stave off complexity rendering my iPhone complicated. My motivation is so that I can access the local data file (# 3) and to do so I must retain iOS version 4.3 thus constraining the device as a closed and non-adaptive system. The iPhone tear-down illustrates and demonstrates the broad collections of things — the logic board, chips, battery, LCD to name but a few — and the iPhone is described as a single technology — a smartphone — but that simple inspection does not reveal all, can *not* reveal all, because there is a complexity and that is what I stave off by preventing its upgrade. The physical components are a

<sup>111</sup> Map data ©2011 Google, DigitalGlobe.

complicated and reductive system but the operating system, that layer of software between device and other layers of software, is an emergent object or thick-thing entangled with its environment but not so entangled that I can't disconnect it to prevent a specific interaction: the upgrade to iOS 4.3.3 that enables Apple Inc. to encrypt the local data file from #3.

\* \* \* \*

The iPhone device (#1) has been parsed with integral reference to other assembled items, such as the teardown (#2) and data file (#3). The result is a sketch of complexity that can be arrested, stalled, and the remote corporate intentions interrupted by the local user. Who is entangled with who in this relationship? At this stage, Apple Inc. is entangled with the end user and the device not so easily retracts as withdrawn and object like from the user. However, the combination of human and nonhuman composite of device and user do withdraw from Apple Inc. When narrated in this way these things could be like objects with a parthood as specific as an iOS version and with a sense of self-determination that is almost autopoiesis. This scenario, captured in this briefest of sketches, translates the assembled material gathered under the rubric of fieldnotes into a burgeoning description of an object. This scenario, so far, is a fledgling ontography that suggests but I maintain does not fulfil the object orientation championed by Bryant.

What did I conclude: was that thing or object? Which of the elusive two did I reach and which approach offered most access: a thickened flattening of things or a flat objecthood?

This is the final realisation. The pursuit of an agency is useful; except for the tendency to expect or to ascribe a result. Despite nearing what seems to be an object I still maintain that agentic relations are best left in thickened, entangled, intra-related states. This is why Bennett's interest is in the vitality surrounding things and not so much the things themselves because they are each just rat, stick, pollen etc. Those plural states are a configuration that is a complicated or complex vitalism. There is no captive thing or object after analysis. There is a revised dynamic revealed during encounters and narrated as an informationalised connectivity, a digital splace, which in this project is what manifests in the sites and scenes that migrate between places and information spaces that have been enabled by Augmented Reality.

The conflation of these technologised circumstance into a digital splace, as explained in

chapters one and two, can be identified by way of a reformulated materialism to revise amongst other concerns a visible notion of infrastructure as presented in chapter three. Human and nonhuman collectives are reconsidered as configurations of objects or things in a debate between flat or thick in the beginning of the present chapter. What was at risk was information spaces and places confused as a conflated digital splace. Instead, those spaces and places have now been demonstrably parsed. The indescribability of human and nonhuman technologised actants can be explained without avoidance (by blackboxing or automagic) and on its own terms with the emic categories of complication or complexity.

Technology-entanglement has two sides. This account hasn't achieved an exclusive nonhuman point of view and the relevance of a thickened account is reinforced because admittedly a human point of view is inescapable. The three propositions regarding specificity, complication or complexity, and entanglement allow for a shift towards a still inevitably anthropocentric but sympathetic view of nonhuman thick-things entangled in the human relations of m.com/do. This shift towards entangled thick-things is not an attempt to reassert an anthropocentric perspective thus dominating nonhuman things. Instead, chapter five continues to develop this preference for thick-things with a series of reconciliations that reinforce the inextricable relations between human and nonhuman agencies of technology-entanglement. Agency is reconsidered to better account for distributed agentic relations amid the complication or complexity of technology-entanglement. From this standpoint a critical sensitivity to thickened and technology-entangled things is demonstrable (in the section Eye-wear or Eye-ware) and a 'how-to' for parsing technology-entanglement is provided as a methodological contribution for other digital researchers to adapt.



## Chapter 5. Interpreting the Thick-things of Technology-entanglement

The technologies are all these things that, despite all these things being quite ubiquitous, have this very very huge degree of complexity behind them, kind of motivating them or enabling them.

(quote 85)

Chapters one to four have presented a series of re-figurings of "all these things" to reveal their motivating or enabling forces. In chapters one and two there was a shift from typically human encounters with place, those media items found in a photo collection to a discursivity of media and technology-enabled practice that revealed a realm of specificity. Chapter three saw a closer inspection of media items and enabling technologies: those media systems of systems that lie in plain sight and are (mistakenly I propose) ignored as an invisible infrastructure. That closer inspection in chapter three revealed an explainable state of either complexity or complicated once the accounts of those contemporary descendants of the gypsies of Macondo were consulted. There has throughout been an open question regarding object or thing, probed by a debate about flat or thick and examined again by deploying an emerging criticality with a particular type of textualisation presented as a tear-down. This thesis has advanced the argument, developed as an interpretive framework of three propositions, that augmented reality demonstrates a thickened and tangled form of technology-enablement. The technology-entanglement is complicated or complex formations of inter-operating human and nonhuman associates.

This final chapter begins with a reminder of progress and finishes with an enactment of the interpretive framework. The chapter begins with a rehearsing of key insights from chapters one to four presented as a series of interpretive transformations. The revisiting demonstrates the critical responses of this thesis as an interpretive framework constructed to respond to contemporary conditions that are prone to reckless *imaginaires* or automagical thinking. This emerging criticality functions as a means of access. This interpretive framework is a way to parse contemporary conditions that are multiple realism(s) of technology-enabled place and information spaces into collective entities that are complex or complicated. The first insight revisited in this chapter is the anthropological one that considers a human thickening amid technology-enabled things in section 5.1. A second insight revisited is a final attempt to sense, think and narrate that human concern for the agentic—a vitalism—amid a beyond human complexity in section 5.2. The chapter



concludes by recognising a transitional encounter when the hand-held augmented realities of this project are potentially superseded by a form of technology-enabled eye-ware. This chapter demonstrates the interpretive framework with a reinterpretation of connected and interoperable media and technologies as thick-things of technology-entanglement.

### **5.1 A Preference for Thick Things**

Unless we're thinking about actually developing some internet technology, and then we might say I need a database, a web browser, a web server, you know, this that and the other in order to bring together the whole package.

(quote 120)

This project set out to describe the indescribable this that and the other that is brought together into a whole package of complication or complexity. The descriptive encounters in chapters one and three revealed the presence of thick-things when actual encounters exposed the tangle of people and technologies. The tangle of technologies was spatialised, vastly distributed and hidden from view. People as individuals or collectives are mediated by the tangle of technologies and they act as intermediary thickeners. The "this that and the other" featured in this thesis has described this particular instance of Augmented Reality as thickened and entangled.

Like Bennett, I also "identify with members of my species" but I extend her thingliness to attend to thick-things so I may act as a cognitive agent interacting with layered and distributed media and technologies. The position I reached in chapter four will not let me horizontalise the world completely because I am aware of many human and nonhuman interdependencies that are technology-entanglements. I agree somewhat with Bennett, "that [an] attentiveness to (nonhuman) things and their powers can have a laudable effect on humans" (Bennett 2004, p.348), but those affective relations need to be extended to include intra-active relations with the complication or complexity of the many nonhuman things featured in this thesis. The material of the previous chapters has rearranged distributed media and technologies that were conflated as an augmented digital space topographically into regions of technology-enablement, media spaces, spatialities and experiential event/time (see the network of associations in figure 3). Then stratigraphically and with rift opened by the use-case of this thesis, enabling layers of human and nonhuman thick-things were inspected. Encounters relocated our point of view from a site one is suddenly set down at to the vastly distributed global network of scenes with its hidden

depths of below ground cables and over the air network infrastructures that is never inanimate and seldom unattended by human agents who reconfigure material relations via immaterial means.

Chapters one to three could have drawn on thickened descriptions to develop member explanations into a theoretical explanation of the production and consumption of place within the encoded spatial experiences of Augmented Reality. In other words, the socio-technical facets of Augmented Reality could have provided observable practices of cultural production that layer multiple modes of data and photographic representation. However, such a reliance on social or cultural abstractions is contrary to the intent of this research, propelled by Latour's rally against convenient 'socio-' explanations and Kittler's dissolution of processual relations of media and cultural production. Instead, the collection of observations and evidence from encounters are reconsidered in this section in order to progress the task both Latour and Bennett began, that is, to explain the collective of human and nonhuman things which our informant gypsies refer to as a whole package.

'Objects' or 'things' was not a terminological indecision. Nor is it a diacritic (after Appadurai) that might be wielded from orbit to reveal a heaving circularity perhaps explainable as a discursivity of withdrawn objects or aloof things. Instead, chapter four preserved an ambivalence toward objects and things, drawing on the work of: Bennett and Latour as representatives of thick and thingly subject-object distinctions; Barad and Bryant as proponents of an equal flatness where an object is not subordinate to a subject. Chapter four attempted an extension to the reformulated materialism represented by Bennett and aspects of Latour and then tested the flatness of Bryant and Barad in a staged debate. Throughout the staged debate I deliberately treated object and thing as something agentic within some sort of collective, such as a network (after Latour), thingly assemblage (after Bennett), perhaps an ecology (after Parikka, Capra and Morton) and an objecthood (after Bryant). The perspective that emerged suggested a compatibility between their collectives of objects or things and this provided a revised explanation of interoperable and connected technology-enabled practices as technology-entanglement. That compatibility has encouraged a particular receptiveness to hear anew accounts of an everyday technological-enablement, such as:

The conversation turned around to be more about how he performs his testing role and then just sort of filled in the blanks based on that, and that was a reasonably complex suite of things,

so like a flash application wrapped in a web page, a testing tool written in .NET using a JS API to talk to a Flash API that was talking to the Flash object in the web page, so you've got C# you've got .NET runtimes you've got a .NET library that's facilitating the talking to the Flash component, the Flash interface, you've got a distributable that comes out of the .NET library that can be run independent of it or Visual Studio as a sort of IDE and then, none of these things he was using himself, the end result was this runtime that talks to the application, and the application in this case is a Flash object in a web page.  
(quote 95)

That anecdote from our informants, the gypsies of m.com/do, reminds us that an everyday technology-entanglement is a member of a reasonably complex suite that is a broad collection of interoperable objects *or* things.

This chapter continues to cultivate this ambivalence about the difference between object or thing because those objects or things, whichever they are, occur in complicated or complex relations. Those objects or things interoperate. At this stage I also extend this ambivalence with a query for the reader. This query is to prompt reflection (and nag at expectations) about everyday encounters with technologies. What else could be configured from an array of technology-enablers similar to the revised spatial reasoning and automagical processes implied by: the aesthetic of Vionnet's landmark photography, Odell's virtual road trip, the Darknet glocal WIFI mesh, observations of corporeal screen mediated travel, augmentation of Atiu, Google Street View of Sam's Bagels and the witnessing of assisted GPS? What speculative use-cases could and may emerge from an emerging criticality when equipped with the dyadic construct of complication or complexity to enable us to parse thickened and entangled technology-enablers anew? Will the form of criticality developed in this thesis support a scepticism toward reckless *imaginaires*, a recognition of technology-entanglement, distinctions between complicated or complexity that better equip human involvement in one and evasion of the other? To restate the lingering ontological interest picked up by this chapter: consider what could be augmented and what would become augmented when equipped with a preference for thick-things and an attentiveness to complication and complexity.

To assist with answering such questions, a consideration of media in chapters one and two has connected with an im/materialist interest in things in chapters three and four. The

impetus provided by Appadurai, Castells, Kittler, Parikka and Fuller has been transformed by my modification of Latour and Bennett in order to accommodate a multiplicity of media and technologies that are an indescribability of complication or complexity. This thesis has created ethnographic representations of media analyses with emphasis on the tangle of connected human and nonhuman entities (as extension of Latour and Bennett). Those ethnographic representations, the encounters between human and nonhuman, have been relocated to a site Pink would refer to as an ethnographic place and which I named *m.com/do*. This transformation has revealed an expansiveness of media and technologies. We have entered the screen, chasing media things through a distribution of mediating things. The screen is not just a frame. The screen is a permeable surface to pass through and just another of many layers of media things. Those layers have been cast in a stratification of realisms by Bhaskar and inspected via a series of encounters. The encounters have passed through the multiplicity of continuous relations between symbolic functions at levels of software code or data and levels of hardware and infrastructure.

The pursuit of things was fruitful but somewhat frustrating, productive but unyielding, never quite isolating an agentic assemblage that seemingly returned our gaze. Much absorbed our gaze but the new materialist attention perpetuated a Tardian entanglement with parthood that never escaped its mereology, to borrow and combine the vocabulary of Latour and Bryant. Instead, the pursuit has been usefully assisted by technology-enabled projects as intermediaries, to cultivate a suitable distance before the things begin to shimmer in the scene at those sites, as occurred with Vionnet's Stonehenge. Direct encounters were difficult. As an outcome of my attempts I prefer to refer to those legendary technology-entangled inhabitants of coexisting human and nonhuman realities as *those things* because I can't get close enough to my elusive target to refer to them as *these things*. Perhaps this reinforces their objecthood. Their withdrawn orientation, drawn away as an anticorrelate of human subjects because they are massively distributed beyond our reach. This is the vocabulary of Morton (2011), Bogost (2012) and Bryant (2011) who build on the principles of Harman's Object Orientation (2009) set in opposition to Heidegger and put forward as their extension of Latour. Their language is an object orientation of the hyper, dark, and alien. Their objects are a contemporary Other. Perhaps what I refer to as *those things* might equally be examined as objects with the lexicon of Object Oriented Ontologists except a human correlation continues to exist, inescapably for this project at least, because those things are encountered through interactivity.

The difference between this final query into the ontological status of those media and technological objects or things and preceding explanations of thickened things is an interest in those objects or things as an agentic assemblage that is an enabler of change. The enquiry is tilted to a notional *becoming augmented* in order to rebalance an appeal to the nonhuman with a continued acknowledgement of our human entanglement in what is still a synthetic construction of media and technologies despite those complex or complicated formations operating at a beyond human scale. The anthro-decentrism attempted in chapter four has not been a denial of the anthro or subject — how could it be in this firmly ethnographic project? These tangled nonhuman trajectories simply remind of an equilibrium too easily neglected when human relations are explained merely as socio and the synthetic construction of im/material relations, as informed by our gypsies throughout this thesis, is deemed invisible in plain sight. With Latour and Bennett's influence I will again attempt to write an account of those things (or objects). Like Bryant and Bogost, I will concern myself with the being of specific objects (or things) and what that might explain about becoming augmented.

This project set out to describe the indescribable and this thesis has demonstrably pursued that objective by expressing those indescriptive forces and forms as complicated or complex technology-entanglement but never realising a complete description of those thick-things and so never fully rendering the indescribable as described. The following three acts of reconciliation revisit insights from chapters three and four by recalling encounters and sources featured in chapters one to three. Referring to these acts as reconciliations establishes their format as the concluding renegotiation of lines of enquiry furthered during the thesis and final acceptance of vastly distributed media and technologies as *still* indescribable.

My first act of reconciliation is to re-balance the human contribution to nonhuman constructions. This project has been concerned with the technology-entangled practice of Internet technologies that create a sense of place. It is an examination distant from human geography but still it matters what the facts and concerns of humans are. That subtle invocation of Latour is a reminder of his rally: to unravel socio from technical. An examination of media and technology-enablers such as those presented in this thesis easily descends to subterranean depths of technology and practice. The descent was instigated by Latour then propelled by Manovich and Fuller's call for Software Studies to descend down the rift past user interfaces and everyday human-computer interactions into the kernel of

operations between material and immaterial media and technologies. The descent would reach that prescriptive domain between physical hardware and logical software to find comfort within a multiplicity of media akin to the interests of Kittler and Parikka. But oxygen is limited down in those electronic spaces of circuits and assembly code. The signed sticker placed on the circuit board of a wireless access point is as interesting as the transistors and capacitors it rests beside.

The reason for drawing attention to the stasis of that sticker is that it does rest and the chain of actants responsible for its placement have imbued something else into that circuit board. Now that sticker with a fleeting drawl of ink, an utterance of quality assurance, rests nearby its results but far removed from the distributed locations of this circuit boards manufacture. The sticker rests but many actants continue to operate: interoperating. This sticker completes the electronic device with whatever internal or external procedures govern what attributes, qualities and interactions have been reconstituted as quality so as to *assure*. A re-balancing of these details, this specificity, is required to retain within view their functioning as parts in relations with both human and nonhuman entities alongside a level of specificity that is transistors and capacitors. This re-balancing will keep in view the distinctions between subject, object, and thing in their various relations. It is anticipated that the particular balance, one struck in this thesis between the perspectives of a reformulated materialism and an object orientation, will be a balance that provides contemporary explanations of being mediated by an indescribable complication or complexity at a time of technological ubiquity that entangles as it mediates.

The re-balancing of human and nonhuman is attempted by rendering compatible two accounts of thing. The full set of things are 'thing', 'subject' and 'object' with thing being the focal point. The two accounts are the distinctions between thing, object and subject as made by Latour or Bennett and the synonymous usage of thing and object within an anti-correlationist stance of Object Orientation as advocated by Bryant or Morton. I will next introduce a selection of further building blocks and signposts from Latour, Bennett, Bryant and Morton to retain some separation of object and thing as I deliberately flaunt conflation of object or thing to make sense of their compatibility: to make sense of their interoperability. This treatment is brief so that I may quickly continue with sketching a speculative account of technology-entanglement with a clearer sense of the merit of objects together with or instead of my preferred thickened things.

Latour's reality is a materialism of objects and things situated in or constituting an increasingly different and always changing something that is transformed from some-things by this thesis to a collective of complicated or complex things. This thesis is a contemporary account of technology-enabled practice that is striving toward a realism based in materialism. The materialism has been revealed as a technology-entanglement of sites and scenes. Enablement has become entanglement thus flattening the superordinate and enabled human. For Latour, "objects become things, that is when matters of fact give way to their complicated entanglements and become matters of concern" (Latour & Weibel 2005, p.41). Here Latour reminds of the intermingling of fact and human concerns when realities are co-constructed. The objects and things of media and technologies are the indescribable of that entanglement. An object is an associate of subject and a stand-in for objectivity. Objects become things.

Bennett also differentiates objects from things but with a mild difference from Latour. Bennett explores traces of independence in search of an exterior experience. Her exploration of a vital materialist vocabulary examines the *thing-power* of *things* as a dynamic that is an external materiality "of the thing formerly known as an object" (Bennett 2010b, p.xvi). Her enquiry is a pursuit of the distributed agency of human and nonhuman working groups: a thingliness.

Bryant provides his argument with a notional objecthood, specifically: an objecthood articulated by a vocabulary that reveals synonymous and overlapping variants of entities. Bryant's (2011) lexicon for an Object Orientation suggests that an object may be: an actant, split, reflexive, a vehicle; and suggests (in response to Barad's influence) that plural objects are an entanglement (Bryant 2011, p.132). Objects overlap as parts and the intersection encourages mereology: the consideration of parthood with respect to these variants of object. This lexicon is proving useful but it lacks an active dynamism thus renders entities in stasis. Alternatively, Morton (2010; 2011) promotes what seems a connectionist perspective that accommodates either complication or complexity of objects or things because his vocabulary includes mesh and ecology. These terms are deployed within a theoretical conjuring of an evocative repertoire of everyday and textual sources by Morton. Mesh and ecology are transferable to this project by relating them to complication or complexity.

The combination of Latour, Bennett, Bryant and Morton provides for an awkward dynamic

that encourages alternative accounts from encounters with commonplace human constructions. Relevant encounters are with entities within view and beyond reach, such as: the four satellites in outer atmosphere needed for GPS (in response to Latour) or the detritus congregating on a street grate (as response to Bennett) as a mereology of parts (after Bryant) that reconnects with what we may encounter as ecological thought, which emphasises a connected multiplicity distributed far and wide (by extending Parikka with Morton). The impetus here propels us toward a vitalist materiality of a complexity that is recognisable but still an indescribable realism. The justification for this task is present what Morton says here:

We become aware of the worldness of the world only in a globalizing environment in which fiber optic cables run under the ocean and satellites hover above the ionosphere.  
(Morton 2012, loc. 1723)

The justification I derive from Morton's attention to an awareness of worldness is for a necessary awareness of a beyond human synthetic that recognises the imbalances of human and nonhuman interoperating entities. This awareness consolidates this approach as being about collective formations and not about a singular human (and subjective) point of view. A possibility now is to provide an account that reveals how a vitalist interest in complication or complexity could extend to ecological thinking about media and technology-enablers. Such an ecological approach could examine the intensities of human concerns that operate in co-existence with nonhuman matters which support a beyond human synthetic. However, that possibility won't be explored because it exceeds the capacity of this project to engage a larger community of participants.

The second reconciliation continues from the first by recasting the multiplicity of human and nonhuman media and technologies in beyond human synthetic formations that are complicated or complex. The objective at this late stage of the thesis is a revised equilibrium to extend the encounters with media and technologies from chapters one to three: those media systems of systems as multiplicities that are either complicated or complexity. The influence sought from Morton has been to alter our perspective of connectivity and distribution from a networked model to an ecological perspective that is accommodating of complexity.

This equilibrium is a transitional moment. This research remains a pursuit of agentic



relations and not the identification of technology-entangled agents. A concern for indescribability has led to a pursuit of agency — of human and/or nonhuman flattened collectives of things or objects — that does not isolate the individualising agent from the collective agentic, preferring instead to retain a sense of agency as inevitably distributed. What is wanted from this thesis is the re-animation of those agentic things or objects with a vitalism and thickening in order to rekindle their dynamism in these interpretive accounts so that their parsing, which is potentially a form of reductive dissection, does not reduce things into complicated inert parthoods or encapsulated black-boxes concealed by automagic.

The reducing of agentic collectives to inanimate substance, or re-blackboxing by encapsulating as a complexity that is beyond human reach, ignores the vitality of those collectives and reinforces distractive discursive frames such as socio- or automagic. Instead this thesis reveals the specificity of complication or complexity and continues to operate interpretively within and around the vitality of those human and nonhuman collectives. The media beings and those agents who are becoming mediated by an agentic collective remain in Flows and Scapes as broad collections of things. However, *thing* has been thickened to reveal contemporary realisms that are a beyond human global scale of technology-entanglement. Those thick-things are distributed between places and information spaces and inclusive of the distant orbiting constellation of satellites and co-constructing actions of human and nonhuman entities tethered via WIFI access points to ducted and buried cables. Agentic relations have been pursued through a multiplicity of media and technologies and presented as encounters throughout this thesis. Encounters included the geospatial datum from Exif fields of a photo in chapter one or the massive distribution of electronic parts that never escape a human hand, whether marked by quality assurance or are hand-held during use when augmented in Atiu. Interpretations have re-situated those fragmented sketches in a beyond human worldness of technology-entanglement.

An outcome of this thesis (and a deliberate limit to the scope of it) was introduced in the previous reconciliation. This project's brand of vitalism could serve as precursor to an enquiry into synthetic ecologies which is an opportunity for an alternative project to develop from this thesis. Parikka (2012) and Morton (2012) could have a greater role when intersection between media, hyper-objects and thingliness is developed into a model informed by perspectives on media ecologies and/or ecological thought; still with the support of Bennett's vitalism (2010) as an attempt to balance system and thing and Latour's

anthropological inquiry into modes of existence that are crossings involving technology (Latour 2013).<sup>112</sup> Theorising the complication or complexity of technology-enabled practice as technology-entanglement has been achieved within the specific scope of this project. The layered contemporary notion of media has shifted interest from media texts as objects or things that were seemingly technology-enabled and re-situated them within a technology-entanglement that recognisably operates in beyond human synthetic ecologies.

The *things* of enablement have been recast as a technology-entanglement and they are entities referred to everyday as a system. Except, a system is singular and isolated and the initial approach of this project to engage with indescribable complication and complexity was to recast system as a member of a *system of systems* (Firesmith 2010). The use-case of Augmented Reality is the focus that transforms Media Studies' various interests in media and technology (via Castells, Appadurai, Kittler, Fuller and Manovich) or the systems view of media as computational (Wardrip-Fruin 2012; Wardrip-Fruin & Mateas 2014) into encounters with a complicated or complex media system of systems. These transformations from things to aggregates and then further still to collectives of thick-things amid a system of systems provide interpretations commensurate with contemporary hand-held encounters that augment places and create digital splaces. The argument now takes these notional escalations of agents into interdependent entities, of media becoming systems of systems, and turns to Capra to invoke his explanation of ecosystem as offering closure to the second act of reconciliation:

All living systems need energy and food to sustain themselves; and all living systems produce waste. But life has evolved in such a way that organisms form communities, the ecosystems, in which the waste of one species is food for the next, so that matter cycles continually through the ecosystem [thus] ecosystems are organized in terms of food webs, that is, networks of organisms; organisms are networks of cells, organs and organ systems; and cells are networks of molecules [and so] it is important to realize that these living networks are not material structures, like a fishing net or a spider's web. They are *functional* networks, networks of relationships between various processes ... the network is a nonmaterial pattern of relationships.  
(Capra 2005, p.34)

---

<sup>112</sup> However, that alternate project would be counter to the ethnographic approach of this project which is a methodological constraint that should not be over-extended to encompass a greater scale of encounters that an ecological approach warrants. A project example that operates at the opposing scale is Phototrails (Hochman et al. no date) which accessed 2.3 million photos and processed them using analytical software methods.

The argument's third act of reconciliation is to invoke a sprawling systemic view of a synthetic ecology as a realm of interoperability. Interoperability is the founding doctrine of m.com/do and the premise of Fielding's technical architecture (Fielding 2000; Fielding 2002). This view of a synthetic ecology is a vastly different image to ecology as environmental. This reconciliation does not relate directly to Capra's explanation of living system but leverages it to suggest a vitality of synthetic things situated in coexistence and interoperating *with* or *in* broader collectives of things. The sprawling synthetic ecology I invoke is an alternative to Parikka's "perverse, complex ecology of it all" (Parikka 2012, p.98) that began in chapter two as a multiplicity of materialism (Parikka 2012, p.99). The purpose of this image—a beyond human synthetic as a realm of interoperability—is to provide an alternative to the sense of ecology as a concern for coexistence that Morton puts forward as ecological thought (2012). My interest is in interactivity and not survival of members or sustainability of the ecology. My interest is interoperability. My interest is in the complicated or complex states as a meaningful difference that is concealed by convenient *imaginaires* such as those revealed by declarations of automagic. Perhaps coexistence and interoperability are synonymous. Perhaps not so much. Perhaps not at all when the distance of the ontological divide is between a social conception of immaterial technologies (e.g. automagic) and a vastly distributed parthood (i.e. the simultaneous connectivity and inscription described in the account Witnessing Assisted GPS in section 3.2). These media systems of systems are a sprawling synthetic ecology of ecosystems not to be confused as a singular ecosystem.

The preceding reconciliations have reinforced the indescribable multiplicity of media and technologies entangled in complex or complicated human and nonhuman relations. The reconciliations shift the perspective of those relations from *fragmented* to *beyond human ecologies teeming with interoperability*. Now, to return to the encounters with the objects or things this project actually describes. Let us return to iPhone and data files that had a part to play when augmented on Atiu.

The iPhone device was parsed in the sketch in section 4.3 (as item #1) to identify many other assembled items, such as the instructional tear-down (item #2) and the cached data file (item #3) which was an enabler hidden from view but accessible. The result was a sketch of complexity that can be arrested, stalled, the remote corporate intentions interrupted by the local user. Section 4.3 asked who was entangled with whom in that relationship and demonstrated how Apple Inc. was entangled with the end user and device

because the combination of human and nonhuman composite, of device and user, were able to withdraw from Apple Inc. and resist upgrading their iOS version. That relationship is like any object with a parthood represented by the specificity of iOS version and with a sense of self-determination, an almost autopoiesis. That scenario, captured in this briefest of sketches, translates the assembled material gathered under the rubric of fieldnotes into a burgeoning description of an object. Although, for reasons soon to be suggested, I prefer to explain this as a point of view of things.

The sketch in section 4.3 was written as a tear-down. A tear-down could be a rhetorical model for a fledgling ontography following Bryant's (2012) recommended second model for a flat ethics from the point of view of the object. I say fledgling because such an ontography expressed by human concerns surely would struggle to be divorced from human concerns because it is difficult with description to un-become human as readily as Bryant does. He does this with philosophical sleight of hand in the debate in section 4.1, invoking Sartre (Bryant 2011, p.57), to evade a human self and escape to a nonhuman collective. Instead this description of objects or things has been cast as a reformulated materialism, after Latour and Bennett, and written with a modified vocabulary from the point of view of those things as thickened things. That point of view is an encounter with and observation of their vitalist complexity. The following reflects on my admitted preference for thick-things (as advanced by the reconciliations of this section) with a final re-consideration of the intersection between Latour and Bennett.

I consider again Latour's realism grounded in a materialism of objects and things and his remark that reality is not what it used to be. Contemporary forms of technology-enablement by objects or things are computerised. Two figures of speech collide to encourage attention on a seemingly everyday but increasingly different and always changing something. Perhaps *reality* would have been a more convincing assertion to use than 'something' but that would reinforce a merely naive concern with realism. The rhetorical collision is a truism intended to focus on a contemporary matter, and to risk another double meaning, the truism is not concerned with reality as much as it seeks out realism(s) in materialism thereby concerning ourselves with contemporary matter. Matter is stuff like the facts or concerns of objects and things.

This pursuit is encouraged by Latour, and perhaps a Latourian hallmark is all too evident in the obtuse passage — that matter is stuff like the facts or concerns of objects and things —

which inflects back onto itself with figures of speech that evoke Latour's matters-of-fact and matters-of-concern (Latour 1999b; Latour 2005; Latour 2009). The simple point being made is that this contemporary account of technology-enabled practice strives toward a realism grounded in materialism. The materialism is a theorising that can encompass the technology-entanglement of sites and scenes that connect, that interoperate, between places and information spaces. Latour's influence remains pervasive here. The term entanglement has been readily adopted and substituted for enablement. The intrinsic superordinate status of the *enabled* human has been toppled, brought down to size, equalised with technology, flattened, potentially removed or just left in situ as superfluous and surrounded by stuff like objects and things concealed by reckless *imaginaires* and automagical black-box devices.

Objects and things are the stuff of realism(s). These objects and things are the indescribable that are this project's target for description and interpretations. Beyond Latour, I complement and extend his reformulated materialism with the vital materialism of Bennett and her notion of thing-power.<sup>113</sup> Each of these has been trialled via encounters with technology-entanglement. Let us push further our refinement of a vocabulary that can continue to accommodate the teeming interoperability of objects and things *with* or *in* those complicated or complex broad collectives that are beyond human and synthetic ecologies.

Latour and Bennett both distinguish object from thing. For Latour, objects *become* things when facts give way to complicated entanglements and become concerns (Latour & Weibel 2005, p.41). Latour substantiates the propositions of this thesis but his motivation differs and is best historicised into a chronology that remembers his tussle with science and predates recent de-anthropocentric object orientations circa 2009 found in or in reaction to the work of Object Oriented Ontology.<sup>114</sup> For Latour an object is an associate of subject and a stand-in for objectivity and he invites an object orientation because of his reference to the object oriented programming paradigm as he relies on metaphorical translation of such practice to his concern at the time for objects and things (Latour & Weibel 2005). This reference to object orientation by Latour is best set aside as a chance suggestion and not in

---

<sup>113</sup> I locate an intersection between Bennett and Latour in her *Parliament of Things* (2003) where she takes her agentic cues from Latour's human and nonhuman collectives in *Pandora's Hope* and Barad's notion of intra-action.

<sup>114</sup> The core of an extensive network of theorists includes Bryant, Bogost and Harman (see chapter four).

fact a direct precursor to an Object Oriented Ontology. At least from this a distinction is evident. Objects become things, and perhaps Latour's preferred terminology of actant could be deployed in this argument instead of object or thing. Except, the distinction between object and thing has been deployed in the reformulation of a diverse materialism (in this thesis) that encompasses the matter and the immaterial of technology-entangled sites, human scenes and nonhuman things. The inclusion of matters of concern alongside matters of fact is a distinction between objects and things that reinforces this project's preference for thick-things. Concerns thicken and convert objects to things.

Bennett recognises Latour's vocabulary, acknowledging the relevance of his term actant and his attention to things without any commitment to the question of subjectivity, as human and nonhuman actants are considered equally in support of a distributed agency (Bennett 2010b, p.xiii-ix). Bennett similarly differentiates objects from things but there exists a mild difference worth isolating first. Latour is concerned with entanglement whereas Bennett's interest explores traces of independence in search of an exterior experience:

...the strange ability of ordinary, man-made items to exceed their status as objects and to manifest traces of independence or aliveness, constituting the outside world of our own experience. ...[to] become vibrant things with a certain effectivity of their own, a perhaps small but irreducible degree of independence from the words, images, and feelings they provoke in us.  
(Bennett 2010b, p.xvi)

This is Bennett's exploration of a vital materialist vocabulary; an examination of thing-power and an out-side looking for the "liveliness intrinsic to the materiality of the thing formerly known as an object" (Bennett 2010b, p.xvi). Her enquiry is a pursuit of the distributed agency of human and nonhuman working groups whose "efficacy or agency always depends on the collaboration, cooperation, or interactive interference of many bodies and forces ... as an agentic assemblage" (Bennett 2010b, p.21). I deliberately frame her enquiry as a *pursuit* because there is a difficulty in her task that may, I argue, not exceed the dichotomous bind of sprawling interrelationships and an expectation of an agentic independence. Bennett's distinction between objects and things reinforces this project's preference for a thick-thingliness but does not go so far as considering those thick-things with or in synthetic ecologies of media and technologies teeming with interoperability. Her concern for the collective agency of rat, pollen, etc is a useful extension of thing to thingliness but the vastly distributed things of augmented reality are

so much more than her agentic assemblage caught on that item of infrastructure, the street grate. With this limitation in mind, the perspectives of Bennett (and Latour) prompt the question: is 'agency' a suitable term if the interrelated energies and associations under consideration are found to be distributed and diffused beyond reach? As a response to that question, technology-entanglement contributes a more appropriate extension to thingliness than self-localising agentic assemblages.

We will visit Macondo again and linger in Bennett's imagined company in the next section, to see what she may see if she were to sense, think and narrate with a now further revised vitalism informed by this thesis' argument about complicated or complex relations. Before that, there is one last scenario of complication, complexity and beyond human relations to review. I want to complete a Tardian inversion of abstraction from detail by observing an inescapable human trait amid minutia of technology-entanglement circulating in orbit. This is my view from orbit of a globalised media system of systems that is a vastly distributed human and nonhuman technology-entanglement. The following scenario illustrates what it is to become augmented amid a beyond human synthetic ecology.

Astrodynamics is not as cosmological as it sounds. The various events and respective activities of different offices are as earthbound as they are intergalactic with domestic concerns for hygiene as departments and staff wonder how to keep up the housekeeping in orbit using vampire satellites (Slashdot 2011a). Vampire satellites? It seems that Buendía's foreseeing of the trans-national globalised world of Fuguet's McOndo, when that magic carpet loaded with children flew past his window, has been surpassed by an evocative characterisation of a self-disassembling technology. This vampire example is not suggesting Vinge's concern that humanity will manifest in a singularity with fang and talon. This is another example of technology-entangled projects, an example of vampire satellites, that demonstrates the preparation of an anxious and complicated response to objects and things of human manufacture operating in a beyond human region. What was once perceivable as a contained system of devices may have already exceeded an unknown threshold and has become a sprawling synthetic ecology with indescribable complexities and undiscovered realisms concealed by black-box encasement. I preserve here the notional indescribability this project began with and remain open to an even greater

indescribable presence of a synthetic dark matter<sup>115</sup> that shrouds the beyond human and immaterial.

Astrodynamics is an inter-agency response. An inter-agency concern is the tracing and prediction of trajectories. Agencies that are interoperable to varying degrees track the events and durations amongst a catalogue of objects, parts and things as a means of having and maintaining situational awareness for the purpose of conjunction assessment. How interesting. In other words, they remotely monitor the orbits of all manner of stuff, like satellites or inventorised debris, from their earthbound locations to determine possibilities and decide on manoeuvres for those astronomical objects or things so that stuff does not collide and disrupt our earthbound monitoring of movements and our determination of possible movements as we use GPS technologies.

Latour didn't admit the half of it when commenting on the expansive materialities of things digital as illustrated by the three GPS satellites required to get a signal.<sup>116</sup> Actually, those expansive materialities which are enablers of Augmented Reality required an attention to detail at a level perhaps guilty of pedantry and beyond Latour's quip. Latour is almost correct: one satellite provides a signal and three satellites allow for triangulation but it requires four satellites to accurately locate oneself in the world because the fourth is required for error-checking of the system's interoperating parts. Furthermore, a simple spatial experiment with different GPS equipped devices revealed that accuracy can range from a few metres to much greater inaccuracy than a human can compensate for, as illustrated by the difference of 25 metres visible in the on-screen display of co-located devices in figure 27 in section 4.3. What's more, there is an extension of agencies with inter-agentic actants of which astrodynamics is just one tributary. The satellite is just one element in this expansive materiality. The expansive materialities of things digital extends beyond four satellites to include earthbound devices, manufacturing processes for quality assurance and inter-agency relations teeming with beyond human synthetic ecologies just to mobilise our photo collections so they in turn can heave and circulate in a multiplicity of media and technologies of which Augmented Reality is one example. Using GPS to monitor or determine movement is not as simple as the transmission of a timestamp from orbiting

---

<sup>115</sup> Similar to Sholette's (2011) sociological conception of dark matter in the art industry as the necessary foundational mass that is invisible and supporting the highly visible minority that is the pinnacle of art, I suggest a relevance to industries of technology-enabled media that rely on a vast majority of material and immaterial objects or things that are hidden in plain sight.

<sup>116</sup> Recall this from section 3.2, expanded further to include inventorised debris and inter-agentic agencies.



atomic clock to earthbound hand-held device. It seemed so much simpler on Atiu at the start, in chapter one, with iPhone held high in the air.

These inter-agency relations amongst collectives of objects or things is a reminder of the many unknowns: a synthetic dark sector that is the objects, things and the relationality that governs them. Those things fascinate by way of their capacity to capture and direct as they interoperate with and in complicated or complex formations. This perspective reminds us of the expansiveness of locative relations around this contemporary stuff; expansiveness in both senses of distributed and moving. This relationality has an extensive range and an energetic capacity to expand which constructs via technology-entanglement the beyond human and complex or complicated relations of this project.

The pursuit of agency between earthbound and cosmological entities is a fascinating account of technology-entanglement to Buendía and so this chapter will continue to evade his reckless imagination by drawing on the subtle shifts introduced via the preceding reconciliations. A shift explained earlier was the shift from reasoning to realisms introduced via Latour's attention on matters of fact and matters of concern as distinguishing objects and things. That shift emphasises a multiplicity of media and technologies that forge new forms of spatial reasoning that are technologised and cause informational transformations (such as augmentation) as well as causing spatial movement. As we've established already, that hovering icon while augmented in Atiu relies on four not three satellites kept in orbit by inter-agency relations. These are im/mobilities of spatial realisms. The informational and spatial frames of references collide or combine with one another into extended relational forms of spatial reasoning that negate any suggestion of empty space, reinforcing Newcombe & Huttenlocher's (2000) emphasis on relational spatial reasoning and reminding us of the evidence from encounters presented in support of revised forms of spatial reasoning. Examples of revised spatial reasoning include the grinding and polishing of aggregate iPhone data in section 3.2 or the virtual travel of Odell in section 2.2 or the im/mobilities found in the photo collection in section 1.2 when device lost sight of satellites and began imprinting inaccurately historic data on future photographs until connectivity was re-established.

The next shift will reinforce our argument's increasing recognition of a void between agency or even actant and the expansive relationality of stuff. Here, stuff is more than a collection of objects, things, and their parthood, be they human or nonhuman. The term

stuff has repeatedly appeared in this section and now it has stretched to include a dark sector that may or may not be an out of this world and Universe-occupying synthetic creation with extensors creeping beyond Earth's atmosphere. The former includes space junk and rocks following whatever trajectory they follow as well as a galactic immateriality such as the geomagnetic storms produced by the sun. The latter extensor is an example of stuff that is the constellation of satellites dispatched to orbit and managed from Earth to provide the Global Positioning System as an informational infrastructure—a system of systems—that enables the earthbound monitoring and determination of mobilised events as we use GPS equipped hand-held devices.

There are still actants but their independence is challenged, perhaps threatened, at least questioned. The expectation of an autonomous construct as outcome from the pursuit of an agency amongst complexity is misplaced and a question is whether that pursuit is futile? The shift I am proposing is to acknowledge the motivating concern as syntactical and to identify the pursuit as one that pursues with fascination inter-agentic configurations that offer alternative accounts to a conventional description of site, scene and technology-enabled things because of how those entangled things enable humans to imaginatively construct and sustain our occupation of digital spaces.

Now to turn our attention with ongoing fascination to an example of some sort of astro-terrestrial entanglement. An engineering feat with a lifespan of 50 plus years and an as yet unknown longevity because complication is superseded by complexity. The Astrodynamics of our satellite constellation is a present day sociological significance potentially comparable to the scientific interest in the transit of Venus that began with Kepler in the 17th century (National Research Council 2012). The interest in the transit of Venus was to improve measurement of the astronomical unit but it appears that the contemporary astro-terrestrial synthetic ecology of complication or complexity will not directly inform the precise calculation of earthly units of measures. The algorithms and technologies of global positioning can improve the precision of spatial locations.<sup>117</sup> However, there now exists another requirement for increasing precision: what about the precision required to sustain the Global Positioning System in orbit? What about the systems of Astrodynamics which the Global Positioning System operates within, which (to quickly descend back to earth) our ground-level media producing and consuming activities such as geotagging of photo

---

<sup>117</sup> See example of innovations to improve reliability from NASA (National Aeronautics and Space Administration 2010).

collections and Augmented Reality browsing all operate within? The geospatial type of media systems of systems featured in this project are caught in a *beyond-human* astro-terrestrial entanglement because of their dependence on not three satellites but at least four. Those four are members of a fleet and each member must be protected from damage by collision.<sup>118</sup>

Astrodynamics is a subfield of celestial mechanics that is concerned with the orbits of synthetic objects around Earth (National Research Council 2012). The following encounter describes matters of both fact and concern within Astrodynamics to reveal a test for our human capacity to co-exist inter-agentially, as an interoperating collective of agentic relations, within complication or complexity at beyond-human scales to provide and sustain an infrastructure of and for those technologies. Latour was right to disagree with Meillassoux (Meillassoux 2010, inside cover) because the mathematical exteriority Meillassoux seeks depends upon the inter-operability of many realisms. Data, algorithms and devices are not separated from humans as nonhuman objects. They're interoperable thick-things and so math at this scale operates within a fragile co-dependent form of entanglement. The algorithms operate within formations of complicated and complex human and nonhuman relations that are technology-entanglement.

### *Encounter XIII A Momentary Change from Complication to Complexity*

This encounter reveals a momentary change. The pertinent event was a collision and their ongoing concern is with potential collisions (PC). The following statements describing this event are extracted from pages 12 – 25 of a report assessing the US Air Force Space Command's Astrodynamics Standards (National Research Council 2012).

*In February 2009 the commercial communications satellite Iridium 33 collided with the Russian military communications satellite Cosmos 2251. The collision, which was not the first recorded between two satellites in orbit, but the most recent and alarming, produced thousands of pieces of debris, only a small percentage of which could be tracked by sensors located around the world. In early 2007, China tested a kinetic anti-satellite weapon against one of its own satellites, which also generated substantial amounts of space debris.*

*These collisions highlighted the importance of maintaining accurate knowledge, and the associated uncertainty, of the orbit of each object in space. These data are*

---

<sup>118</sup> Collision is not the only threat to satellites in orbit. Another threat is a major solar event such as the near-miss July 2012 coronal mass ejection from the sun which could have caused a geomagnetic storm and affected satellites in orbit as well as electronics on earth (Phillips 2014). However, the risks of space weather and collision are not a direct concern of this project. The tracking of a complicated tending to complex orbiting assemblage of debris is of interest.

*needed to predict close approaches of space objects and to compute the probability of collision so that owners/operators can decide whether or not to make a collision avoidance maneuver by a spacecraft with such capability.*

*The space object catalog currently contains more than 20,000 objects, and when the planned space fence radar becomes operational this number is expected to exceed 100,000. A key task is to determine if objects might come close to each other, an event known as "conjunction," and the probability that they might collide.*

*Because of the strong interdependency between astrodynamics modeling and the accuracy of propagated products, the current systems run by the Air Force and those run by external entities that use JSpOC products are typically coupled.*

*However, incorporation of disparate data types and validation of information received from external sources are currently manually intensive.*

*As scientific knowledge of orbiting objects has progressed, simplicity and order have thus given way to complexity and chaos. The term "chaos" here and throughout the report is used in the technical sense to mean that small perturbations can, in some circumstances, result in large changes in orbits.*

*Products and services can be more loosely coupled in an SOA, making it easier to provide advanced products to some users while still supporting legacy products for those who do not need a change and may have no funds to adapt their organic systems to the advanced products.*

*The JSpOC currently uses the algorithms found in AFSPC standardized astrodynamics algorithms for a significant portion of its daily space operations, in which it must detect and track space events and maintain a catalog of more than 20,000 space objects. A typical day at the JSpOC using the standardized astrodynamics algorithms includes:*

- Collecting and processing 400,000 satellite observations;*
- Updating at least three times a special perturbations precision catalog on more than 20,000 objects;*
- Preparing and transmitting 200,000 Space Surveillance Network (SSN) sensor taskings; and*
- Processing 30 detailed conjunction assessments as a result of screening more than 1,000 active payloads against the special perturbations catalog of 20,000 objects.*

*On February 10, 2009, the Iridium 33 satellite maneuvered into the path of the inactive Russian communications satellite Cosmos 2251, resulting in a collision that destroyed both satellites and left a debris cloud in a densely populated orbit regime.*

*Before the collision, the JSpOC was screening only about 300 Department of Defense (DOD) and National Aeronautics and Space Administration (NASA) satellites for conjunctions.*

*Without knowledge of the accuracy of the covariance, users cannot calculate a reliable risk and make informed decisions about when to perform evasive maneuvers to avoid potential collisions.*

*To make meaningful decisions on whether to expend limited fuel for an evasive maneuver, the owner/operator of a maneuverable satellite needs some knowledge of the uncertainty in the covariance propagated to the time of closest approach from which the owner/operator can calculate a PC.*

*Established users such as NASA have developed procedures and devote significant manpower to computing the PC and tracking the evolution of the PC over time to gain confidence in the trend being seen.*

\* \* \* \*

This example of astrodynamics marvellously demonstrates the formation of multiplicities when complication becomes complexity. There are outcomes from that example to dwell on.

Satellites collide and multiply. Two objects become thousands of things, instantaneously, when trajectories converge in a moment. Collisions generate data. Collisions generate data as historical records and that data is used for future predictions that determine the probability of collisions.

Keywords capture the intricacy of human and nonhuman relations: 'strong interdependency', 'accuracy', 'external entities', 'coupled', 'disparate', 'manually intensive'. Those keywords reveal an uneasy vitalism that is, of course, complicated and/or complex. Explanations of a loosely coupled SOA and the adaption of advanced products mirror explanations of technologies from our informant gypsies.

In concurrence with Latour's Tardian involution, simplicity and order have given way to complexity and chaos in this example. Except, I disagree. I propose that there was never a simplicity. Simplicity is a motivation fuelling layered social constructions that conceal with automagical explanations and produce evasive reckless imaginations. The scenario preceding the collision of those two objects was already a complicated scenario when those inter-agency relations were originally screening 300 satellites for conjunctions.

The destination is m.com/do. The acronym SOA is a Service Oriented Architecture that can be deployed as a REST architectural pattern, which is the im/material basis explained in the introduction of this thesis as a founding principle of m.com/do. Here in this example it is introduced as the enabler of ease and advanced products that are new and old. Yet, despite the faith in a m.com/do nonhuman digital splace, the presence of humans is secured with

the control point when "informed decisions" are made. And, the human presence is reinforced as the reference to informed decisions shifts to an alternate and retrospective mode of "meaningful decisions". All of which is situated, still, in an indiscernible hybrid of "owner/operators" and computational processes dedicated not to calculation or accuracy but to a human concern: "to gain confidence".

For some reason, and perhaps this is just a reflection of contemporary technologies, faith is placed in an increasing level of complication (i.e. the granularity of SOA our informants speak of) that is an enabler of emergent loosely coupled REST-like SOA solutions. This contemporary specificity is also commensurate with Latour's Tardian involution but I am hesitant to follow that path. As previously explained in section 4.1, carding in chaos is not an explanation I will adopt. Instead the argument developed here needs to recast this site of entanglement as another example from [m.com/do](#).

Now we are ready to finish. The preceding reflections of this section have extended technology-entangled complicated or complex formations to include interoperable relations that extend the human and nonhuman location of [m.com/do](#) into orbit. The preceding encounters with interoperating technology-enablers has established a beyond human synthetic that reinforces those co-constructions as technology-entanglement. The thesis will finish with a re-examination in sections 5.2 and 5.3 of multiple realisms within a frame of reference extended by technology-entanglement. These extended realisms stretch through subterranean ducting as an invisible infrastructure that spans inter-jurisdictional informational prompts of on-board PA announcements and immigration check-points and reaches like extensors beyond the sky to an orbiting constellation of objects and things subject to the perils of atmospheric drag, detritus and space weather. Let's return to the automagic of Augmented Reality to go beyond Latour's limited sense of an expansive materialism and to extend Bennett's vitalist thing power to include the complicated or complex forms of technology-entanglement. The next section seeks to definitively explain a vitalist complexity and the final section re-presents these conditions as a criticality in order to inform a speculative use-case for eye-ware.

## 5.2 A Vitalist Complexity

I think the reaction is just that 'well why does it have to be so complex'.

(quote 108)

Having dwelt on the question of object or thing this section will now revisit upon the materialism of Latour and Bennett the critical perspective developed throughout the thesis. Their materialism informs a momentary shift of a point of view that is not so much into the world of the nonhuman, as Bryant attempted, as a view of humans amongst the nonhuman. The interpretive framework developed in this thesis extends from that point of view to that of humans aware of themselves amid a complication of technology-entanglement but wondering aloud: why does it have to be so complex?

This step in the argument is an attempt to interpretively rethink how to *think agency* amid the complicated or complex technology-entanglement introduced in chapters one to three and explained as collectives of objects or things in chapter four and section 5.1. This interpretation is a point of view suggested by Bryant (2012) and has been developed from Bennett's self-awareness of herself as researcher and the slipperiness of distributed agentic relations<sup>119</sup> (Bennett 2003; Bennett 2010b). I refer to this reinterpretation of agency, indebted to Bennett and Barad, by thinking of the tangled agencies of technology-enablement as a vitalist complexity. What I am considering is a revised sympathy that reflects the point of view of those nonhuman objects or things. What is captured in this section is a sympathetic point of view of technology-entangled objects and things in their complicated or complex relations. Can I now set aside my narration as researcher to represent an alternative perspective? And which perspective will be reflected predominantly in the text: the 'other' of nonhumans or a technologically-entangled account of thick-things? How much nonhuman can be explained humanly about a vitalist complexity?

This final lingering phase of the argument begins with Bennett in the village of Macondo. The village scene for this invented account rehearses the criticality emerging from Bennett's 'input' to this thesis. The village scene with Bennett can be taken as a prequel to the fictional tale of technological progress from Macondo to [m.com/do](http://m.com/do) that has haunted

---

<sup>119</sup> Here I reinforce Bennett's problematising of the distinction between agencies or agents (see note 37 Bennett 2010b, p.151) to develop a sense of public informed by Barad's intra-active agential realism (see note 15 Bennett 2003, p.15; Bennett 2003, p.16 and note 39 Bennett 2010b, p.108; Bennett 2010b, p.152) to remind that humans are inextricably enmeshed with distributed nonhuman agencies (Bennett 2010b, p.108).

us, befittingly for that narrative, in the form of Buendía's reckless imagination kept in-check by descendants of the gypsies he entrusted his fascination to. This is a final visitation to Bennett. The return to Macondo rather than m.com/do is a visit to a location inhabited by humans at a time when nonhuman technological things noticeably arrived.

A revealing account would be to outline a view from the imagined Bennett household, relocated, as a last glance at Macondo. What follows is an attempt to describe what Jane Bennett might see if she resided in Macondo making her observations from one of the many houses located with the forethought of Buendía so that all would enjoy the same privileges of residence as each other because they are able to draw water with the same effort and receiving the same amount of sun as the others (Marquez 2009). As a town planner, Buendía aspired to the equality Bennett, Latour, Bryant and Barad sought in chapter four and co-constructed relations for orderly co-existence and interoperability amongst inhabitants, just as Fielding's (2000) abstract technical architecture has done for m.com/do.

Bennett would be as perfectly placed as everyone else in the village to observe and participate in the full encounters of village life. She would have a privileged position for participant observation that, in my view, exceeds that of the singular encounter with a large men's black plastic work glove, a dense mat of oak pollen, an unblemished dead rat, a white plastic bottle cap and a smooth stick of wood in the grate to the storm drain in front of Sam's Bagels on Cold Spring Lane (Bennett 2010b, p.4). Instead, Bennett could further her "cultivated, patient, sensory attentiveness to nonhuman forces operating outside and inside the human body" (Bennett 2010b, p.xiv) within the village of Macondo by studying the confusion of inhabitants and ingenious inventions in Macondo's crowded streets as she follows the trail of human and nonhuman power (Bennett 2010b, p.xiii) theorising the unfolding events of Macondo as encounters between actants that produce effects and alter the course of events (Bennett 2010b, p.viii).

Unable to see what my imagined Jane sees I will say what Jane might say as a speculative account that is derived from the Tale of Technology in Macondo in appendix one and presented here as a plausible example of participant observation. Thickened descriptions require a thickening agent. I will attempt an analysis with the sensory attentiveness of Bennett. The purpose of this mimicry is to hone my own cultivated naiveté as I look for what I consider an unaffected simplicity so that I may fluidly interpret complication or



complexity without any hindered immersion. I will now say what Jane might see, speaking from a presumptive stance as an exercise in mimicry to further develop and refine the criticality that I propose as a fluid inter-operability.

Experiencing Macondo is a sensory experience. Bennett would hear the uproar from her adobe house presumably just the same as everyone else. This is usually the privilege enjoyed by all in Macondo, a village laid out equidistant from all sites so as to equally distribute the energy expended by the inhabitants of Macondo. However, it is unclear from the narrative and absence of a map if the gypsies conformed to this principle of town planning when arriving at camp, setting up their tents near the village with a great uproar of pipes and kettledrums to signal the display of new inventions. The gypsies were unexpected on this first visit when they bought the magnetic ingots and so it is expected that Macondo, this village of solitude, did not afford a campsite located equidistant from the adobe houses of each resident. The uproar of the gypsies would have travelled across the village, incrementally seeping into the nearby houses, the sound spreading from their off-centred camp site just as sound is known to progressively travel in waves.

Bennett would have noticed this decentering in Macondo just as I notice the decentering of human and nonhuman interactions in a way that tends to complication or complexity during my encounters in *m.com/do*. From her equidistant house she would see the gradual dispersal across human and nonhuman hybrids, as the sound washed over inhabitants and lapped at adobe walls. She would become immediately curious about what the implications might be later that day as mobilised residents of households, those away from their house at the time, regroup and recount to each other their exposure to the uproar. Bennett would notice the social destabilisation in response to this aural event and she would wonder what confederation would now form from the encounter-prone, associative, social bodies that were dispersed amongst equidistant adobe houses to afford equitable experience but were consequently and ironically reinforcing the inequality of this emergent experience of contingencies.

Bennett would be attuned to how encounters between human and nonhuman actants and protoactants can produce effects, and she would say: the pipe and kettledrum were used to signal arrival, a unique signal performed to herald the arrival of inventions, an aural mobilising that permeates the air with a greater reach each year than the visual sight of those inventions. Bennett would understand the sociological vitality of this performance

she witnesses (Bennett 2010b, p.14). Bennett would observe the increasing range of the thing-power of those inventions, to shroud the village as a cloaking mechanism entangling humans and nonhumans as equal participants in a shared vital materiality.

Bennett would reflect on that observation later. Initially she would be an active participant in the unfolding confusion. A combination of her experiences and her curiosity triggering a sensory attentiveness to the unspoken encounters as they unfold between: instrument, visitor, adobe home, town planning, resident, inhabitant at the time, neighbour and sound. The arrival and uproar would cue "a certain anticipatory readiness" (Bennett 2010b, p.5) to attend to the role of this performance as invoking "the curious ability of inanimate things to animate, to act, to produce effects dramatic and subtle" (Bennett 2010b, p.6). This particular assemblage that Bennett might attend to is what I recognise from [m.com/do](http://m.com/do) as hype. A combination of beneficiaries, instrument, object and motive all shrouded by the aural notification of arrival.

For this tale of technology in Macondo, the pending commercial exchange between gypsies and residents indicates both parties may be beneficiaries of an association forged by opportunity and concealment of motives. Melquiades' interest in sharing discoveries of learned alchemists of Macedonia and the Jews of Amsterdam would perhaps go unnoticed at first by Bennett and only remembered when the new gypsies arrive later to the sound of pipes, drums and jingles announcing the latest and most startling discovery of the sages of Memphis and sharing what the new gypsies claim to be possessions of the King of Solomon as they offer rides on their flying carpet. Bennett through her analysis of thing-power would relate her observations of village life when the gypsies arrived to her expectations of the nonhuman objects that are as significant a visitor as the gypsies themselves. Perhaps the fanfare would be misconstrued as the affective relations of things.

Bennett might remember Melquiades' interest in Macondo's development. His motivation could be easily compared to the later disingenuous gypsies with their threadbare carpet but could she progress such an analysis? As demonstrated in previous encounters of this thesis, the interpretive framework helps to compare the hype of Melquiades, as he revealed discoveries of the world brought to Macondo and available for exchange and re-exchange, comparing him to the new gypsies who would offer only transient experience for the village of Macondo to enjoy the pleasure and not the benefit of their new offerings. Buendía would pay 15 reales so he and his sons could experience the touch of ice. The flying carpet

was merely an object of recreation and not a fundamental contribution to the development of transportation. An interpretive task seemingly similar to Bennett's thing-power is different and challenged in *m.com/do* by the vastly distributed *im/materialities* we encounter. We must parse and reassemble with a fluid inter-operability to reveal the social relationships between complicated or complex formations of human and nonhuman thickened things. The interpretive framework developed in this thesis provides an interpretive method to do so.

Bennett's anticipatory readiness would lead on to her deciphering those encounters between humans and nonhumans beginning with the conative and encounter-prone bodies that are able to modify and be modified by others — a parallel I can now link to the beginning of this thesis at the corporeal place of Atiu in chapter one. She could isolate the difference between village encounters with Melquiades and later encounters with the new gypsies as being encounters for exchange of goods and encounters for the experience of goods. She would identify the inanimate magnets as a part of the active matter of Macondo, as the "walking, talking minerals" (Bennett 2010b, p.11) inclusive of the human inhabitants, noting how the people have lost their autonomy. But would Bennett note how the assemblages are now centred around the new gypsies whereas the old assemblages centred around the villagers of Macondo? The objects and things capturing the villagers' attention were once an asset for the potential development of Macondo and have more recently become a mere item of attention. Without a thickened account of things their status as enabler or entertainment is lost.

Now to resume my role as researcher and critique that account—that fictional participant observation—when Bennett observed the arrival of technology in Macondo.

I am initially undecided if this reflects an increase or decrease in the thing-power of these ingenious inventions. But here I will disagree with what I speculate Bennett would conclude. The increasing spectacle and performance is a reduction in the thing-power of these inventions. The ontological divide has grown in the recent assemblage of gypsies, villagers and inventions. The persons and things have separated and no longer unite in resultant effects, as occurred when Buendía took ownership of the magnets and then went on to trawl the riverbed with his gang as an act of wealth creation. The ontological divide has grown whereby the spectacle of their arrival cloaks their felt presence. That limited presence is reduced to a transactional exchange of reales for nothing more than a brief encounter. The historic mobilisation of arrival announced by pipes and kettledrums as

heard in Macondo by Bennett has a contemporary parallel in m.com/do and it is not the descendant gypsies, our informants, who deliver technology with the hype of pipes and kettle drums:

My first thought was of, you know that web site Gizmodo, which just makes me cringe all the time the kind of salivating fanboys kind of writing vaguely pornographic descriptions of new technologies, most of which is sort of vapourware and would never eventuate, and it always comes across as quite sycophantic, and quite awful to be honest, so that was my first thought of written descriptions of technologies  
(quote 168)

There exist equivalences in m.com/do where a written form of fanfare precedes software. Arrivals are announced and take hold in imaginations whilst still being the equivalent of vapour. At least the fascinating block of ice that caught Buendía's attention was solid. So let us block our ears to the fanfare and instead interpretively inspect Articulated Naturality Web.

*Encounter XIV Parsing Articulated Naturality Web*



Figure 28 - An iPhone Mock-up of Articulated Naturality Web

A Metrolink train is en route to Altrincham from Bury in Manchester. What is observable in

this scene shown above in figure 28 and heralded by pipes and kettledrums<sup>120</sup> is this: when the train and pedestrian intersect at that pivotal moment there is an augmented meeting of corporeal and material forms of mobility together with a contemporary real-time layering sourced from information spaces. Figure 28 shows an information panel communicating the next stop is St Peters Square in 1m 55s and a clickable button encourages the purchase of tickets in UK pounds. This encounter is with a re-imagined form of Augmented Reality named Articulated Naturality Web (QderoPateo Communications 2010). The immediacy suggested by this image of augmentation is as expedient as an everyday realism that is an observable natural setting of intersecting corporeal forms and machinery. Interactions appear to happen with the precision of milliseconds. Except, here is where disconnects can be revealed between those complicated forms running steadfast on rail tracks, nearby pedestrians and augmented information from municipal and/or corporate information spaces. Presumably this proposed application would operate by way of interoperable connections over HTTP, the hypertext transfer protocol, and so connectivity will be stateless and with some latency. The disconnect between stateless connectivity with sub-second delays and the Altrincham train is that it would travel approximately 8m/sec. at a reduced speed of 30km/h, meanwhile the application being stateless would not know when or at which position that train was precisely 1m 55s from St Peters Square. Technology doesn't always require a full analysis of its complication or complexity to reveal it will never have a life of its own and the only vitality it has to offer is that of its fanfare. It's too complicated to become a complex life form and demonstrate vitality.

\* \* \* \*

Bennett would note the difference in assemblages of old and new gypsies but I speculatively suggest we would differ in our conclusion about the thing-power implications of those assemblages. I would also ask what does it say about Buendía, supposedly at first most captivated but seemingly at the end most resistant to the thing-power of those newer inventions. I would say that he had become resistant to their thing-power but was lost elsewhere, drawn into a greater realm of material relations. He was lost to the realm of increasing scientific resources that were not at his disposal and his previous fascination was

---

<sup>120</sup> The evidence of this product is limited to a promotional video and coverage in online media sources showing the visual conceptualisation of the system (i.e. not a functioning system), a point duly noted by Sterling: "What splendid promo videos these people make. Really keen to see 'em ship a product or a service one of these days" (Sterling 2010).

reduced to making disparaging remarks about that miserable bedspread flying past his window.

I argue that the tendency to hype for the sake of spectacle reduces the thing-power of those inventions whereas Bennett would likely acknowledge the spectacle as increasingly pronounced animation, drawing people and objects into a constellation surrounding those inventions. The evidence of increased human participation is an indicator of an increased anthropomorphism of those inventions, all of which Bennett would possibly explain as indicators of increased thing-power. In this fictional dialogue with Bennett, I disagree.

These are not mere objects or things. They are thickened things of technology-entanglement and as such demand a certain hybridism between human and nonhuman within these assemblages: one that produces effects emergent from the conative disposition of that hybrid, thereby adding a greater dimension of conatus to Bennett's agency of assemblages. Buendía was right to criticise that miserable bedspread. It was an object of recreation for the villagers and an object of revenue for the gypsies, making no contribution to the development of transportation in Macondo. But would Buendía recognise Articulated Naturality as vapourware or would he recklessly time his boarding of that train having imaginatively purchased his ticket at the click of a button? As an object its thing-power is arguably strong and as a potential technology I argue that its thing-power is weak.

Comparing that miserable bedspread to Articulated Naturality as another immaterial example from [m.com/do](http://m.com/do) reinforces an alternative side to thing-power that Bennett does not consider: fanfare. The human intensity of a hyped assemblage is something that rat, pollen, stick etc never offered for Bennett to contend with on Cold Spring Lane. A human presence remains and the coexistence of human and nonhuman deserves continuing attention. The following questions Bennett's differentiation of objects from things as an exercise to remind ourselves of multiple human and nonhuman agencies. The differentiation of objects and things is a position Bennett shares with Latour.

The perceptible transition from object to thing is explained by Bennett, with reference to Mitchell, as the moment when the subject experiences the object as uncanny, rising up from an objectified depth and looking back (Bennett 2010b, p.2). For Bennett, things are not objects. Things are "vivid entities not entirely reducible to the contexts in which

(human) subjects set them" (Bennett 2010b, p.5). Bennett's vital materialism attends to the relationally between things and subjects. Thing-power is a call from things more than a projection of vocality because things are neither subject nor object when they hail our attention. Things force the suspension of normal operations of perception and cognition when the vitality of matter takes over, such as on one occasion in Cold Spring Lane when glove, pollen, dead rat, bottle cap and smooth stick of wood combine and the positive capacity, the calling capacity of those things, enabled them to rise up and look back (Bennett 2010a; Bennett 2010b).

Bennett explains Latour's experiences of expressive actants as being "a participant in a world swarming with multiple modes and degrees of agency" (Bennett 2010a) that are "conative actants swarming and competing with each other" (Bennett 2010b, p.122). As she attempts to thicken the description of things, Bennett does so with terms such as propensity and trajectory in order to sense, think and narrate agency as a locus of action that is a thingly assemblage of human and nonhuman. Bennett's task is to sense, think and narrate thing-power. She turns to hoarders as a case-study suggesting they have special sensory powers no different from connoisseur and collector and so are able to discern from a haphazard pile of junk things of value. My project has similarities to hers: encounters have demonstrated an accumulation of hidden immaterial things that are enabling technologies or a multiplicity of circulating media items.

As previously explained by our contemporary descendants of the gypsies of Macondo, the nature and influence of internet technologies exceeds what is apparent from observation alone. Internet technologies are made of many parts and demonstrate emergent behaviour doing more than we could imagine when lashed together. What I have required are theoretical insights to untangle the complex and complicated nature of these technologies which those contemporary gypsies speak of. I looked to Bennett and Latour to help bridge between the general notions of complexity theory and the technological configuration of contemporary audio-visual culture explained by the gypsy informants. However there are limitations to their insights (identified in previous sections) and so I extend Bennett and Latour with the dyadic notion of complication and complexity developed in this thesis. This extension enhances their vocabulary of terms such as: actants, networks, assemblages, reversibility and trajectories. From their vocabulary I refine this altered explanation of connectivity, these complicated or complex forms of technology-entanglement, this vitalist complexity.

Latour speaks of networks and actants as "a certain type of circulation that can travel endlessly" (Latour 1999b, p.18-19). Latour's notions resonate with complexity except for his commitment to reversibility. He explains that "we are now faced with the multiple and fully reversible combinations of highly complex individual constituents and multiple and fully reversible aggregates" (Latour 2011, p.9). The circulating whole and its combinations of individual constituents is not an irreducible complexity but something of an analysable network of parts. Admittedly, there are overlaps with complexity but Latour speaks mostly of complication. Latour's key notion that I associate with complication is reversibility.

Bennett, like Latour, pursues an understanding of a collective grouping of actants. Her conceptualisation of part-whole relationships refers to an assemblage as an ad hoc group of diverse elements and vibrant materials that generate emergent properties and demonstrate a certain vital force (Bennett 2010b, p.23-24). Bennett's energetic assemblage fits with the dynamic qualities of complexity. Her assemblages generate effects, they demonstrate efficacy, their emergent properties offering another similarity to complexity.

The technology practitioners, those contemporary gypsies of *m.com/do*, introduced us to the emic categories of complication or complexity that were used interchangeably to explain their technology-enabled practice. The distinction between those terms was recognised during qualitative coding<sup>121</sup> and elaborated with the theoretical input of complexity theorists in section 3.3 and has been extended with input from Latour and Bennett. That connection between complication or complexity and technology-enabled media has been re-framed by Capra to develop a layered contemporary notion of media, as for the use-case of Augmented Reality, an ecological option that encompasses complication or complexity and technology-entanglement. Latour's and Bennett's vascularization<sup>122</sup> has stretched and reframed the term augmentation.

So far in the development of an argument I have been seeking a vocabulary that would articulate so as to untangle complication or complexity. Now I accept the continuing indescribability of technology-enabled practice and instead I deploy terms from a vocabulary that has been revised by this thesis. This signals a shifting of attention from media texts as items of interpretation to their status as complicated or complex assemblages that can be interpretively considered as things of entanglement. In other

---

<sup>121</sup> See protocol, technique, textual data and conclusions in appendix two.

<sup>122</sup> Recall this shared interest from the debate in section 4.1.



words, the media-texts that were seemingly technology-enabled are now re-situated as technology-entanglement together with a revised vocabulary to describe their extended and distributed formation, their thickened and entangled formation: their vascularization. I have taken these notional interdependent entities that are complicated or complex and via Capra connected his explanation of ecosystem together with a conative dynamic as a reinforcement of the vitalism of Bennett's and Latour's vascularization. The argument is complete, so far as this thesis is concerned.

The vitalism of Bennett together with the co-opted input of Latour and technology practitioners has been influenced by the suggestion of ecosystem as a functional network of relationships from Capra's theorising of complexity. The vascularized and entangled complex or complicated nature of technologies, I have demonstrated, is a vitalist complexity. This vitalism is an entangled technologised state that could be complicated or could become complexity. This vocabulary of a vitalist complexity describes being augmented in a way that is a thick, vascularized, human and nonhuman technology-entanglement with a multiplicity of sightlines. To finish, the layered sightlines of hand-held Augmented Reality are revisited and extended further in section 5.3 with examples of another form of Augmented Reality technology.

These explanations of the complication or complexity of media and technology have been specific to a particular use-case and already re-figurings of hand-held Augmented Reality emerged in 2013 as possibilities for 2014 and after. The final section draws to a close this project by applying the interpretive framework to a new use-case of Augmented Reality technology: eye-ware.

### 5.3 Eye-wear or Eye-ware

There's still some notion in which you can kind of replace the word technologies with 'magics' and technology with the singular form and perhaps that would sort of be a fair characterisation of how I use technology, it's all the bits that are kind of magical ... and so, I guess technologies is a slightly wider classifier for all these different kind of forms of bizarre magic that go on in our everyday lives ... when I encounter that complexity I certainly go 'wow that's kind of magical' even though I understand it down to the wires, I still go 'that's pretty magic'.

(quotes 80 & 82)

I find a curious scene when returning to m.com/do. There remains a visible human presence but another confederation of human and nonhuman things takes shape literally before our eyes to construct another augmented configuration: another complexity to encounter. I return to m.com/do to find another evolutionary stage continuing from the transformation of image (and therefore vision) to data. I return to m.com/do to find another example of bizarre magic from our everyday lives.

Is it eye-wear or eye-ware? Let's parse this magic in search of technologies. I will carefully investigate and be guided during my preliminary analysis of what I see and hear by the words and imagery of others. I can gather information but I can't use the technologies and so I am unable to 'gather and use' as has been the method underpinning encounters so far. This inability to use is not a disadvantage because the intended conclusion for this thesis is to test how the criticality developed so far can be deployed to reveal rifts for subsequent projects. For instance, a speculative interpretation was demonstrated when the Articulated Naturality Web project was critiqued in section 5.2. This section tests how a critical sensitivity to thickened and entangled things developed by gathering and using media and technologies under the watchful comments of those contemporary gypsies of Macondo can be deployed to reveal rifts for future projects.

I return to m.com/do to find an expected trajectory of technology continuing on its path: the miniaturisation of components. The miniaturised component is display technology that is the equivalent of a screen. This particular component display technology has become eye-wear and there are many types of products that fit this category of technology in our

counterfactual ethnographic place of m.com/do. As with prior analysis, our review of sources will move flexibly amongst the potentiality of these technological products adopting a stance that reviews their features speculatively by considering what they offer. What I am explaining is a form of interpretation befitting the connected specificities of media and technologies revealed by parsing for complication or complexity. The interpretive approach I will demonstrate in this section is the fluid inter-operability proposed in section 2.3. This fluid inter-operability is an interpretation that traces associations and pursues the cultural codes and social concerns such as the im/mobilities and agentic relations that have arisen in this project. This fluid form of inter-operable interpretation is a means to trace and pursue with specificity any agentic relations. To trace, I parse the complicated or complex relations of a trajectory that has led to a human-scale miniaturisation of display screens and a convergence of visions and data to appear on those screens. With a fluid inter-operability I review whether the emerging fashion in m.com/do is eye-wear or eye-ware.

The componentry of Augmented Reality is evolving and the final analysis, this last parse, will compare between the hand-held technology enablers of Augmented Reality featured in this thesis and what a future investigation into eye-ware should consider. The analytical technique of parsing is intended to draw attention to the componentry and reveal whatever vitality connects it to inter-operable others be they human or nonhuman. On this last occasion we will look for, testing for, a possible disjuncture whereby eye-wear exceeds its placement on the bridge of our nose and becomes eye-ware. The comparison is between hand-held screen use as a method of viewing a real-time camera view (as occurs with Augmented Reality) and screen use when the screen is within the immediate field of view of human eyes. Let's parse.

#### *Encounter XV The Sight-lines of Hand-held Screens*

The episode of hand-held screen use is a scene at St Peter's Basilica shown in figure 29 (Sohn 2013). This photo-schematic is based on an image of technology use that has been presented in news media as an iconic image representing both a new papal era and a new era of smartphones (Dellaverson 2013). That historicisation of technology development has been ignored<sup>123</sup> and instead what is visible within the scene is considered.

---

<sup>123</sup> Kolawole also questions the significance of this event as a smartphone milestone because hand-held device use was already common practice (Kolawole 2013).

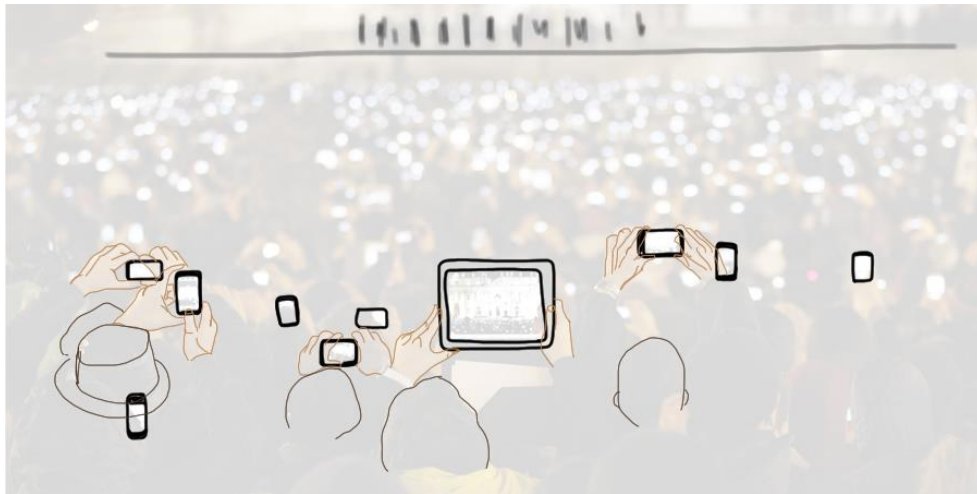


Figure 29 - A Schematic of Hand-held Screen Use in St Peter's Basilica 2013

What appears to be occurring within the scene is that a crowd is standing level and facing proceedings at a higher level in the distance. The quite simple reason for our analytical attention on this image is that it represents a modified point of view similar to the point of view established with hand-held Augmented Reality. The absence of detail makes it difficult to identify what functions those screens serve and so the lack of representational detail about technology use in this scene and what user-base those users belong to helpfully abstracts to an entangled encounter, a thingliness, between screens and people at a site during their experiencing of a scene. They might be using Augmented Reality or they could be taking photos that could become layers of augmentation. A study of how technology is used would be concerned with the individual actions occurring in that scene and would examine the use of named technologies but in doing so would be limited to a shallow connection between two black-boxes, one human and the other a device, as mediated by the representational layer of a user interface. Instead, and by rehearsing the fluid interoperability this thesis is attempting to cultivate, our interpretive attention focuses on the agentic relations of the collectives in that scene.

Compare this scene to the Photo Opportunities of Corinne Vionnet. This scene at St Peters Basilica is a prerequisite to her reconstructions of place from points of interest. The image has become a point of view *of* points of view similar to Vionnet's images. I deliberately focus with selective attention on the multiplicity of these technology-enabled points of view by way of drawing those screen frames and hand-held postures seen in figure 29. The

image in figure 29 serves as a visual reminder of the evolving relations between informational spaces and place as undergoing modification when the trajectory of technology miniaturises and componentry joins us in human and nonhuman confederations. Our sightlines are technologised and that brings with it a thingly series of augmenting layers.

The thesis has established the distributed presence of humans in a beyond human synthetic explained as a technology-entangled media system of systems. The chapters of the thesis have toured the beyond human specificity of m.com/do as found in the interoperable and connected datum of geotagged imagery in section 1.2 or network device local cache databases in section 3.2 or the orbiting complication of astrodynamics that became complexity when satellites collided in section 5.1. We now return to individual human confederations cast in relation to screen technologies and media to consider what human and nonhuman forms this convergence of technologies might reconfigure. The consideration is brief here because that would become another project and scope here only permits brief identification of how the analyses, that parsing, might combine with an interpretive stance, the fluid interoperability, so as to tease out future research opportunities. I will briefly inspect again by way of analytical parsing for premises of complication or complexity.

The scene at St Peters Basilica reveals a typically complicated series of components brought together in a single device in those many pairs of clasped hands: an uncanny parallel at this site as hands clasp together to grip technology and make imagery but not prayer in thingly unity. The series of components visible in this image are frame and screen clasped by fingers that are a part of hands. Whatever software is operating is not apparent from the screen but remaining at a suitable level of abstraction that the picture from figure 29 supports means it is recognisable from their illumination that some software components are also present to capture, process and display in real-time the view as seen by imaging sub-systems through whatever lens is on the opposing side of those screens. Hands clasp, sometimes awkwardly, possibly in an attempt to not conceal the lens with finger or to not create the slightest cast of a fingertip shadow. I recognise the awkwardness of their contorted grip on those hand-held frames that relay in real-time a technologised point of view and create a modified sightline.

\* \* \* \*

Multiple pairs of hands gripping closed systems, the black-boxes adorned with screens in those hands, non-adaptive to the interacting humans clumsy or careful with their fingertips. That is an all too easy interpretation of that scene and one that recognises the necessary constraints of manufacturing: parts like lenses and screens don't move around reassembling themselves as an open system with emergent behaviours. This vocabulary derived from complexity fails to access that scene at St Peters Basilica nor does it allow for a return visit to [m.com/do](http://m.com/do) where the eyewear claiming to be eye-ware is beginning to adorn inhabitants.

The vocabulary of complexity theory alone is inadequate even when extended with a clear distinction of complication as was encouraged by informants who are contemporary descendants familiar to this project. It is inadequate to explain circumstance merely as 'social' or 'complex' and the completion of this project requires more than the utterances of a revised vocabulary and instead needs that vocabulary reset by introducing it within an emic discursive pattern that can be interpretively repatriated. Here the point I make is that a vocabulary is inert without a suitable accompanying discursive pattern to mobilise those terms in relation to the matters and concerns they are attending to. This intention is one gained from Latour: from a disassembly must come the reassembly. The objective is one shared with Bennett: let us think, sense and narrate the vitality of complications and complexities. An outcome is one sought by Parikka: a contemporary excavation for the specificity of media and technologies which for this project has been the photo collections layered by way of Augmented Reality. The final contribution of this thesis is a speculative use-case to demonstrate the critical inter-operating of researcher using the interpretive framework developed in this thesis.

This section reinforces by way of a speculative use-case, that of eyewear or eye-ware, a discursive phraseology that can bridge between the specificity of technology-entanglement and cultural codes or social concerns without resorting to the description of those specificities from the starting point of social or cultural abstractions. Here again I elaborate on the complication or complexity of human and nonhuman relations so we may break through the veil of this scene — this everyday occurrence, this technology-entangled realism — to get beyond the combination of human with nonhuman black-box device: a combination of two unknowns that is unhelpfully prone to either subject-object or just object oriented relations.

With inspection we start to see the formation of human and nonhuman relations take shape. We can see a reassembling of components, the display technology, vision software, hand-held frame, imaging electronics with accompanying sub-systems, and lens. A list which also includes human attributes disguised as technologies: hand-held, vision and lens. The human attributes and their nonhuman interdependencies assemble as actants and take shape in a collective. The collective is a crowd all standing level with hand-held devices clasped not unlike prayer up to or above their heads to alter what is a purely human point of view that transforms their sightline with that intermediary technology-entangled point of view. Members of the crowd appear to benefit from the converged screen and camera technologies as a type of periscope to defy the viewing angles created by the combination of their stature and distant subject. Whether intentional or not a crowd collective is assembling with a point of view inclusive of reach, neck extension, screen placement (influenced by lighting and angles) and resolving power of eyesight, screen pixels and lens. Resolution in this converging collective has become a complicated triumvirate that is a network of vision with three nodes: screen, lens and eye. That triumvirate of parts is also shared by eye-ware.

From that decomposition and reassembly of complication we can recast those attributes of actants as protoactants, perhaps as Bennett or Latour might also attempt to do were their interpretations able to engage with these types of technology-enabled things. Here the hand-held technologies reveal a useful entanglement with humans to combine, augment if you like, by way of a manifestation of conatus that only a human could produce: reach. There is a useful confederation of protoactants to be considered when limbs with muscular and skeletal extended and jointed components are draped with clothes of personal choice and the constricting wardrobe is viewed, flattened, together with the protoactants of human and nonhuman vision. The undertaking of those parts is to contribute a sense of reach with restrictions and rustling as humans manoeuvre to optimise their sightline and enhance their thingly point of view. Arms and lens each reach in their human and nonhuman way as they pivot around the fulcrum of screen and eyesight. Recall this exact encounter, this thingly entanglement, when augmented on Atiu and the icons jiggled on screen in section 1.3. Now let's compare those episodes, reinforced by that image in St Peter's Basilica, with a proposed re-figuring of vision and data by the eye-wear that aims to be eye-ware.<sup>124</sup>

---

<sup>124</sup> To provide specificity to this abstraction, the two named eye-ware products considered are Google Glass, as illustrated in figure 30, (<http://www.google.com/glass/start/>) and Meta's Spaceglasses (<http://www.spaceglasses.com>), as illustrated in figure 31.

The intent here is a brief interpretive engagement that brings closure to this contemporary account of hand-held Augmented Reality without delving deeply into the emerging eye-wear fashion of m.com/do. The intent is not to restart another project with an alternative configuration of technologies as would occur if eye-wear was examined for its full potential as a use-case because that would require another series of encounters with these emerging eye-wear technologies. The intent here is to conclude with an ethnographic representation that is a speculative use-case comparing mobile computing that is hand-held with eye-wear. The comparison being made is between a hand-held and eye-worn convergence of vision and data. That convergence of vision and data is a premise of Augmented Reality. The purpose of this brief and partial comparison between a hand-held and an eye-worn convergence of vision and data is to consider what similarities or difference and so what actual or potential disjuncture might be suggested by the traits revealed when parsing for the complication or complexity of eyewear that claims to be eye-wear.

Another convergence underpinning Augmented Reality is that of data and spatiality. People, places and photos are mobilised (and immobilised) in a variety of layers. This project has featured encounters with a variety of technology-enabled forms of mobility and spatial reasoning such as the corporeal travel, geotagged photo collections and augmented experiences of Atiu in chapter one or the projects of Vionnet and Odell in chapter two. Without having and using the eye-wear it is difficult to encounter that second aspect of convergence and so the spatial reasoning of eye-wear will not be considered in this speculative use-case because I instead reinforce a discursive phraseology that is a fluid inter-operability. This is one limitation to the scope of this project that does not affect this closing speculative use-case but does suggest a natural continuation of this enquiry scoped as another project. A future project to build upon the outcomes of this thesis could pursue the spatial reasoning of technology-enabled gaze when vision, data and spatiality continue to converge literally in front of our eyes thus modifying the proximal dislocation of prior forms of technology-enabled gaze such as camera and hand-held Augmented Reality. The illustration of a Google Glass user in figure 30 demonstrates one modification to their gaze as they fixate to the upper right of their field of view. Other sensory proximal dislocations are also revised by eye-wear and converge with vision. This thesis' examination of hand-held mobilities demonstrated by Augmented Reality has privileged vision but a future project considering eye-wear would need to include aural with vision because the eye-wear rests on ears thus reducing another sensory dislocation. Eye-wear offers more affordances



as a basis for technology-enablement by eye-ware than the hand-held technologies of this project.

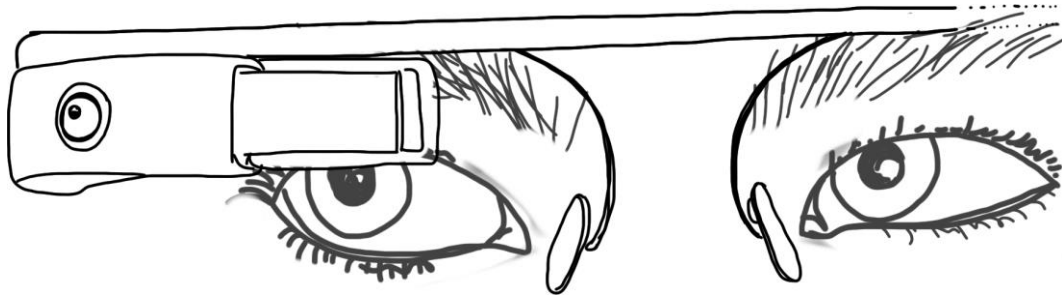


Figure 30 - A Rendition of Eye Fixation with Google Glass

The point of comparison between hand-held and eye-wear is a simple and self-evident one. The point of this comparison is between hand-held and hands-free. With this in mind we briefly consider what alternative augmentation eye-wear offers. We can speculate as to the merits of the device as eye-ware when compared to the reach provided by things like hand-held screens that are used like periscopes to augment what is seen at scenes. What augmentation is provided by way of a convergence of vision and data when the visions are fixed in place before our eyes?

There is a speculative use-case for augmentation that suggests what could be achieved when the visions fixed before our eyes converge with the data we hold in-hand. This speculative example suggests what could be achieved by connectivity between smartphone in pocket, no longer hand-held, and eye-wear on the bridge of our nose. The atomic building blocks exist. There are such things as iPhone or Android smartphone, Bluetooth for connectivity, Augmented Reality software and Meta eye-wear. The latter is only available for pre-order as a META.01 Developer Edition model with a scheduled delivery date three months from the time of writing this paragraph (Meta 2013a) but it does not matter to this demonstration of fluid inter-operability that the status of this technology is pending future actualisation. Recall that haunting remark by Deleuze in section 2.3 regarding the role of imagination to convert potential to actual. Recall the informants concern in chapter two (see quote 20) cautioning attention to a broad collection of things as a singular technology. It does not matter that the singular technology does not exist because the atomic building blocks do. What matters is how the atomic building blocks can interoperate. The atomic building blocks are cast in intricate relations by people9, the author of this speculative use-

case, to suggest a convergence of hand-held computing and Augmented Reality enablers: bluetooth, battery, holographic replica and an unscratchable screen surface. The image presented below as figure 31 is a Photoshop creation and eerily true to holographic form but this is not the manifestation of a reckless imagination.

*Encounter XVI An Emperor's New Clothes Materialism*



Figure 31 - Holographic Phone with Meta Spaceglasses

Smartphones have become an intricate part of our daily lives. For some of us, if we had to choose only one thing to take with us it is our phone. Bluetooth technology has given us the technology to leave our phone in our pockets while still sending messages and calling. How about we take this one step further. Leave the phone in your pocket like you do with your bluetooth, BUT still be able to see it. Whether you have an iPhone or Android, have an app on your phone that projects your phone's UI to a holographic replica in your hand. Use it like you would your normal phone, text, call, etc... A holographic phone can't be scratched, lost, or stolen. Your phone's screen being off in your pocket will also improve battery life.

(people9 2013)

This example of Augmented Reality serves as a reminder of automagic and a demonstration of what the fluid inter-operability cultivated in this thesis can be critically applied to. Here the moment is perhaps an Emperor's New Clothes materialism. In other words, are we being led to believe the invisible will become real while remaining invisible? This speculative use-case for Augmented Reality is an opportunity for the inter-operability I advocate and an uncanny resemblance to the remark of Buendía, that moment the threadbare carpet flew by his window with the children on board. The touchscreen is preserved during the process of convergence between image and data only to render it untouchable and completely dependent on the technology-entanglement that connects a

non-existent hand-held device to eye-wear on the bridge of our noses and smartphone left in our pockets.

With a fluid inter-operability we can imaginatively convince ourselves it could work, without risking a reckless and imaginative pursuit, and we can recognise the atomic building blocks already working elsewhere. The easy part is controlling one computer device from another because the Remote Desktop Protocol (RDP) already exists to provide a graphical interface to other networked computers. Another key interoperability for inter-operable consideration is how hands can interact with hand-held things without holding or touching them. Again, this could be enabled by the code libraries for Unity 3D Hand Tracking from Unity3D as used by Meta for their Spaceglasses complete with "hand meshes, skeleton and gestures" (Meta 2013b). There is already a clear visibility to the invisible holographic projection of an iPhone as seen in figure 31 because useful atomic building blocks already exist.<sup>125</sup>

\* \* \* \*

Here is a sign that complication gives way to complexity. The broad collection of things outlined in this speculative use-case of Augmented Reality can be further disassembled as atomic building blocks. The disassembly will not reduce this suggested formation, a re-figuring of existing technologies, into a complicated assemblage because the technology-entangled layer upon layer of imagery has become augmented as a complex configuration when image was irrevocably transformed by data in interoperable relations. The only thing remaining to connect in this speculative use-case of inter-operability is the transformation of image to data to achieve the holographic replica that is a believable vision to touch interactively. Even the prerequisites for that holographic basis already exist in the form of suspended disbelief that is invested in the symbolic and material basis of a user interface. The imaginative burden that relegates disbelief is carried by the end-user and not the developers thus reinforcing that this seemingly bizarre form of magics could be developed. There are substantiated reasons revealed by this inter-operable parsing, I suggest, that this speculative use-case for a truly automagical form of Augmented Reality could come to exist.

---

<sup>125</sup> That is not to say that technologies emerge by as a result of their intrinsic efficacy without constraint and prevention. Were this project concerned with predicting product development then models such as Winston's (1998) interest in social necessity would prove useful. Instead, this project is a precursor to that effort because 'social', motivated by Latour, is being unravelled from technology-entanglement.

This brief speculative use-case reminds us of the fragmented multiplicity of media and technologies presented during other encounters throughout this thesis. There operate many layered components of vision and data. This final speculative use-case demonstrates how those vastly distributed and indescribable configurations — those thickened and entangled thingly collectives — can be interpretively re-figured. The interpretive framework developed in this thesis empowers thus providing a fluid inter-operability that is conscious of complication or complexity. The framework can untangle and act as a useful antidote to reckless imaginations even when confronted by invisible and seemingly impossible advanced constructs that are nothing more than a broad collection of supposedly new but already existing things.

#### **5.4 A ‘How-to’ for Parsing Technology-entanglement**

Encouraged by the forward thinking demonstrated in the previous encounter by people9, “how about we take this one step further?”

This extra step is an alternative summary for readers seeking a ‘how-to’ that is a guideline for translating this thesis to their research design. Explaining the methods and encounters used to develop the interpretive framework is different to offering method as input to the research design of others. The methodological contribution of the interpretive framework is immersed in preceding chapters as and where it develops. What follows is a retrospective elevation of that framework out of the thesis for others to adapt. First I provide two considerations as a starting point to research design for other digital researchers. Second I provide an alternative summary of the interpretive framework as key actions to complete the how-to and reinforce the methodological contribution of this thesis.

##### **Consideration 1: Reframe the subject and query as a use-case of technologies**

A use-case for the purpose of researching technologies can expand to include many distant enablers and associates. Specify a focussed analytical case (as use-case) with an implicit orientation around an action requiring co-dependencies beyond user interfaces. To illustrate the distinction: I didn’t examine the technology ‘Augmented Reality’. I examined the layering of geo-tagged images from Panoramio on the Layar App using my iPhone in-situ on the island of Atiu courtesy of free WIFI. That was the use-case spanning multiple layered technologies from which co-dependent human enablers and nonhuman associates were found tangled.

**Consideration 2: Embed the use-case in established methodological discourse and adapt recognised methods**

Configure your research design around different dimensions of your digital use-case by drawing on established methodological discourse. Innovate by adapting existing methods to better support im/materialities of digital media and technologies. I was participant-observer of augmented reality with specific forms of access to places and people through membership and researcher encounters. My enquiry was descriptive rallying against indescribable black boxes and social contracts like automagic; theory building was grounded in encounters; methods fell under the rubric of ethnography.

The second part is an alternate summary of the interpretive framework presented in brief as a sequence of key actions for this how-to. The activities of your research design could (and ideally should) differ from the research project that produced this thesis. Similarities and differences will stem from the methodological foundation and methods. However, there are achievable key actions offered by the interpretive framework of this thesis that can re-position researchers into productive association with the many human and nonhuman parts to technology-enablement.

**Key action 1: Stratify layers and seek out specificity**

Reach beyond the user interface of black boxes that have been conveniently qualified too generally as technology with social and/or cultural dimensions. Identify and be specific about what you are claiming to know<sup>126</sup>. Delve into those boxes and get beneath each layer to try and reach the facts and concerns of things, those thick-things, that interoperate from within layers of technology enablement. A test of use-cases developed during consideration 1 is whether they open a rift and advance enquiries by way of relocation to various stratified layers<sup>127</sup>.

**Key action 2: Parse to distinguish complication from complexity**

Practice a different form of analysis. Usage of 'practice' here re-invokes the intersection between the principled intentions of practice-led research and the influential guidance of informants. As a result of those intersecting influences, analysis

---

<sup>126</sup> Recall quote 27 that served as epigraph in the Introduction.

<sup>127</sup> Chapter 1 opens the rift via the display of photos as an augmented reality layer and chapter 2 demonstrates the descent via Castells, Appadurai, Pink, Corner, Parikka, Kittler to reach m.com/do.

in the thesis was motivated by atypical researcher actions like: gather and use, grasp, paw and gnaw, trace and modify, tear down and re-generate<sup>128</sup>. Key action two builds on specificity by parsing the details of things as they are gathered and used.

Configuration details and datum are traced and modified to delimit human and nonhuman involvement. Paw, gnaw and re-generate results to test for or disprove complication as complexity (or vice-versa) across the by now widely distributed specificity that is dis/assembling on your metaphorical tear-down workbench.

**Key action 3: Interpret humans and nonhumans via active flattening and thickening**

A fluid mode of interpretation follows from the determination of specificity in key action one and the more ‘hands-on’ form of analysis I refer to as parsing in key action two. Narrate the parsing by recounting human and nonhuman interactivity. Elevate that level of interpretive account by recognising interactions as an equal intra-acting<sup>129</sup> between researcher and humans or nonhuman things. Imbue those things with a thickened account<sup>130</sup> of their entanglement. Express those accounts of thick-things<sup>131</sup> with a fluid inter-operability<sup>132</sup> between researcher and researched humans and nonhumans in their equalised (via flattening) and connected associations. Realise the contingent qualities<sup>133</sup> of research into media technologies and how your researcher accounts will differentiate your project from the encounters found in this thesis.

This how-to concludes the methodological contribution offered by this thesis. A novel form of participant-observation befitting digital technologies and media has engaged with the specificity of human and nonhuman things to reveal their entanglement in complex or complicated formations. The key considerations encourage researchers to adapt this how-to so their research design can also support a similarly detailed examination of *any* kind of digital thing. The key actions encourage researchers to gather and use; constructing and destructing if need be. Researchers have been shown in this how-to an approach for parsing media technologies; to unpack layers of packaging and labels literally first and theoretically second. Go ahead and overcome discretely concealed ‘Do Not Remove’ stickers. RTFM—did you think to look there too?

---

<sup>128</sup> Examples are gathering and using a photo collection in Encounter II or the teardown in Encounter XII.

<sup>129</sup> Revisit the debate in section 4.1 for clarity around ‘equal intra-acting’.

<sup>130</sup> Thick-description is not intended as a methodological restriction to only ethnographic projects.

<sup>131</sup> This reframing of ‘things’ occurs in chapter 4.

<sup>132</sup> Revisit the refined criticality proposed as a fluid inter-operability in section 5.2.

<sup>133</sup> As example, the Methods section explains this project’s dependency on an early iOS version.

To finish this how-to I have a request and a challenge. A request I have for future researchers is to adapt this how-to for other methodological approaches so as to demonstrate more use-cases of technology-entanglement and specific formations of complication or complexity. And a challenge I put to future researchers is to disprove technology-entanglement with thickened accounts that are demonstrations of a technological simplicity that is truly automagical.

## References

- Abbott, A. 2004. *Methods of discovery: heuristics for the social sciences*. New York: W.W. Norton & Co.
- Adams, P.C. 1997. Cyberspace and virtual places. *Geographical Review*. **87**(2), p.155.
- Adams, P.C. and Warf, B. 1997. Introduction: cyberspace and geographical space. *Geographical Review*. **87**(2), p.139.
- Adey, P. 2010. *Mobility*. London: Routledge.
- Alder, K. 1998. Making things the same: representation, tolerance and the end of the ancient regime in france. *Social Studies of Science*. **28**(4), pp.499–545.
- Alder, K. 2007. Focus: thick things introduction. *Isis*. **98**(1), pp.80–83.
- Anderson, L. 2006. Analytic autoethnography. *Journal of Contemporary Ethnography*. **35**(4), p.373.
- Anderson, P.W. 1972. More is different. *Science*. **177**(4047), pp.393–396.
- Appadurai, A. 1990. Difference and disjuncture in the global cultural economy. *Theory, Culture and Society*. **7**(2), pp.295–310.
- Appadurai, A. 1996. *Modernity at large: cultural dimensions of globalization*. Minneapolis: University of Minnesota Press.
- Appadurai, A. 2006. The thing itself. *Public Culture*. **18**(1), pp.15–22.
- Apple Inc. 2011. iOS 4.3.3 software update. [Accessed 29 October 2013]. Available from: <http://support.apple.com/kb/dl1358>.
- Ars Technica 2011a. Are software patents the ‘scaffolding of the tech industry’? [Accessed 14 August 2011]. Available from: <http://arstechnica.com/tech-policy/news/2011/08/are-software-patents-the-scaffolding-of-the-tech-industry.ars>.
- Ars Technica 2011b. Lytro’s new light field camera. [Accessed 21 October 2011]. Available from: <http://arstechnica.com/gadgets/news/2011/10/lytros-new-light-field-camera-lets-you-focus-after-you-take-a-picture.ars>.
- Ars Technica 2011c. Owning the stack: The legal war to control the smartphone platform. [Accessed 13 September 2011]. Available from: <http://arstechnica.com/tech-policy/news/2011/09/owning-the-stack-the-legal-war-for-control-of-the-smartphone-platform.ars>.
- Atkinson, P. 1990. *The ethnographic imagination: textual constructions of reality*. London: Routledge.
- Atkinson, P. 2006. Rescuing autoethnography. *Journal of Contemporary Ethnography*. **35**(4), pp.400–404.
- Augé, M. 1995. *Non-places: introduction to an anthropology of supermodernity*. London: Verso.
- Banham, R. and Sparke, P. 1981. *Design by choice*. London: Academy Editions.
- Barad, K. 2003. Posthumanist performativity: toward an understanding of how matter comes to matter. *Signs*. **28**(3), pp.801–831.



- Barad, K. 2007. *Meeting the universe halfway: quantum physics and the entanglement of matter and meaning*. Durham: Duke University Press.
- Bennett, J. 2003. *In parliament with things*. Annual Meeting of the American Political Science Association, 16 July 2003, Philadelphia.
- Bennett, J. 2004. The force of things: steps toward an ecology of matter. *Political Theory*. **32**(3), pp.347–372.
- Bennett, J. 2005. The agency of assemblages and the North American blackout. *Public Culture*. **17**(3), pp.445–466.
- Bennett, J. 2010a. *Powers of the hoard: notes on material agency*. The Political Life of Things, 12/3/2010, The Imperial War Museum, London.
- Bennett, J. 2010b. *Vibrant matter: a political ecology of things*. Durham: Duke University Press.
- Bhaskar, R. 1986. *Scientific realism and human emancipation*. London: Verso.
- Bhatta, B. 2011. *Global navigation satellite systems: insights into GPS, GLONASS, Galileo, Compass, and others*. Leiden: CRC Press.
- Biggs, M. and Buchler, D. 2008. Eight criteria for practice-based research in the creative and cultural industries. *Art, Design & Communication in Higher Education*. **7**(1), pp.5–18.
- Bijker, W.E. 1993. Do not despair: there is life after constructivism. *Science Technology Human Values*. **18**(1), pp.113–138.
- Bijker, W.E., Hughes, T.P. and Pinch, T.J. (eds.). 1987. *The social construction of technological systems: new directions in the sociology and history of technology*. Cambridge, MA: MIT Press.
- Bogost, I. 2012. *Alien phenomenology, or what it's like to be a thing*. Minneapolis: University of Minnesota Press.
- Boing Boing 2011. iOS devices secretly log and retain record of every place you go. *Boing Boing*. [Online]. [Accessed 21 April 2011]. Available from: <http://www.boingboing.net/2011/04/20/ios-devices-secretly.html>.
- Brown, B. 2001. Thing theory. *Critical Inquiry*. **28**(1), pp.1–22.
- Bryant, L.R. 2011. *The democracy of objects*. London: Open Humanities Press.
- Bryant, L.R. 2012a. Machine-oriented ethics. *Larval Subjects*. [Online]. [Accessed 14 May 2014]. Available from: <http://larvalsubjects.wordpress.com/2012/10/17/>.
- Bryant, L.R. 2012b. *Questions for flat ethics*. Philosophy Department Talk, 18 October 2012, Arlington, Texas.
- Capra, F. 2005. Complexity and life. *Theory, Culture & Society*. **22**(5), pp.33–44.
- Castells, M. 1983. *The city and the grassroots: a cross-cultural theory of urban social movements*. CA: University of California Press.
- Castells, M. 1985. *High technology, space and society*. Newbury Park, CA: Sage publications.
- Castells, M. 1989. *The informational city: information technology, economic restructuring, and the urban-regional process*. Oxford, UK: Blackwell Publishers.

- Castells, M. 1996. *The information age: economy, society and culture : volume 1: the rise of a network society*. Oxford, UK: Blackwell Publishers.
- Castells, M. 2000a. *The rise of the network society* 2nd ed. Malden, MA: Blackwell Publishers.
- Castells, M. 2000b. Toward a sociology of the network society. *Contemporary Sociology*. **29**(5), pp.693–699.
- Castells, M. 2004. *The network society: a cross-cultural perspective*. Cheltenham, UK: Edward Elgar Pub.
- Cilliers, P. 1998. *Complexity and postmodernism: understanding complex systems*. London: Routledge.
- Cilliers, P. 2005. Complexity, deconstruction and relativism. *Theory, Culture & Society*. **22**(5), pp.255 –267.
- Clifford, J. 1997. *Routes: travel and translation in the late twentieth century*. Cambridge, MA: Harvard University Press.
- Creswell, J.W. 2003. *Research design: qualitative, quantitative, and mixed method approaches* 2nd ed. Thousand Oaks, CA: Sage Publications.
- Creswell, J.W. 2007. *Designing and conducting mixed methods research*. Thousand Oaks, CA: SAGE Publications.
- Daston, L.J. 2007. *Things that talk: object lessons from art and science*. New York: Zone Books.
- Daston, L.J. and Park, K. 2001. *Wonders and the order of nature, 1150-1750*. New York: Zone Books.
- DeLanda, M. 2006. *A new philosophy of society: assemblage theory and social complexity*. London: Continuum.
- Deleuze, G. 2004. *Difference and repetition*. London: Continuum.
- Dellaverson, C. 2013. Witnessing papal history changes with digital age. *NBC News*. [Online]. [Accessed 7 October 2013]. Available from: [http://photoblog.nbcnews.com/\\_news/2013/03/14/17312316-witnessing-papal-history-changes-with-digital-age](http://photoblog.nbcnews.com/_news/2013/03/14/17312316-witnessing-papal-history-changes-with-digital-age).
- Denzin, N.K. 2006. Analytic autoethnography, or déjà vu all over again. *Ethnography*. **35**(4), pp.419–428.
- Denzin, N.K. 2010a. Moments, mixed methods, and paradigm dialogs. *Qualitative Inquiry*. **16**(6), pp.419–427.
- Denzin, N.K. 2010b. *The qualitative manifesto: a call to arms*. Walnut Creek, CA: Left Coast Press.
- Dodge, M. and Kitchin, R. 2004. Flying through code/space: the real virtuality of air travel. *Environment and Planning A*. **36**(2), pp.195 – 211.
- Dourish, P. 2004. *Where the action is: the foundations of embodied interaction* 1. MIT Press paperback ed. Cambridge, MA.: MIT Press.
- Dourish, P. and Bell, G. 2011. *Divining a digital future: mess and mythology in ubiquitous*

- computing. Cambridge, MA: MIT Press.
- Drupal no date. MailChimp module | drupal.org. [Accessed 10 April 2014]. Available from: <https://drupal.org/project/mailchimp>.
- Edwards, P.N. 2003. Infrastructure and modernity: force, time, and social organization in the history of sociotechnical systems. In: Misa, T.J., Brey, P. and Feenberg, A. ed(s). *Modernity and Technology*. Cambridge, MA: MIT Press., pp.185–225.
- Ellis, C.S. and Bochner, A.P. 2006. Analyzing analytic autoethnography: an autopsy. *Journal of Contemporary Ethnography*. **35**(4), pp.429–449.
- Emerson, R.M. 1995. *Writing ethnographic fieldnotes*. Chicago: University of Chicago Press.
- Escobar, A. 2001. Culture sits in places: reflections on globalism and subaltern strategies of localization. *Political Geography*. **20**(2), pp.139–174.
- Fielding, R.T. 2000. Architectural styles and the design of network-based software architectures. Available from: <http://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm>.
- Fielding, R.T. and Taylor, R.N. 2002. Principled design of the modern web architecture. *ACM Transactions on Internet Technology (TOIT)*. **2**(2), pp.115–150.
- Firesmith, D. 2010. *Profiling systems using the defining characteristics of systems of systems (SoS)*. Massachusetts: Software Engineering Institute Carnegie Mellon University.
- Fleming, D. and Nicholson, S. 2013. The contact sheet: combining evocative and analytic modes into visual autoethnography of the moment. *Studies in Symbolic Interaction*. **40**, pp.43–67.
- Flichy, P. 2007. *The internet imaginaire*. Cambridge, MA: MIT Press.
- Foresman, C. 2011a. Android phones keep location cache, too, but it's harder to access. *Ars Technica*. [Online]. [Accessed 6 May 2014]. Available from: <http://arstechnica.com/gadgets/news/2011/04/android-phones-keep-location-cache-too-but-its-harder-to-access.ars>.
- Foresman, C. 2011b. Google faces \$50 million lawsuit over Android location tracking. *Ars Technica*. [Online]. [Accessed 6 May 2014]. Available from: <http://arstechnica.com/tech-policy/news/2011/04/google-faces-50-million-lawsuit-over-android-location-tracking.ars>.
- Fuguet, A. 2001. Magical neoliberalism. *Foreign Policy*. (125), pp.66–73.
- Fuguet, A. 2003. *The movies of my life*. New York: Rayo.
- Fuller, M. 2003. *Behind the blip: essays on the culture of software*. New York: Autonomedia.
- Fuller, M. 2008. *Software studies: a lexicon*. Cambridge, MA: MIT Press.
- Galloway, A. 2013. Emergent media technologies, speculation, expectation, and human/nonhuman relations. *Journal of Broadcasting & Electronic Media*. **57**(1), pp.53–65.
- Geertz, C. 1973. *The interpretation of cultures: selected essays*. New York: Basic Books.
- Gibson, S. 2006. A seat with a view. *Tourist Studies*. **6**(2), pp.157–178.
- Grierson, J. 1966. First principles of documentary. In: R. MacCann. ed. *Film : a montage of*

- theories*. Dutton, pp. 207–215.
- Groves, P.D. 2008. *Principles of GNSS, inertial, and multi-sensor integrated navigation systems*. Boston: Artech House.
- Guba, E.G. and Lincoln, Y.S. 1994. Competing paradigms in qualitative research. *Handbook of Qualitative Research*. **2**, pp.163–194.
- Hammersley, M. and Atkinson, P. 2007. *Ethnography: principles in practice* 3rd ed. London: Routledge.
- Harman, G. 2009. *Prince of networks: Bruno Latour and metaphysics*. Prahran, Vic.: Re.press.
- Harrison, R. 2010. Exorcising the ‘plague of fantasies’: mass media and archaeology’s role in the present; or, why we need an archaeology of ‘now’. *World Archaeology*. **42**(3), pp.328–340.
- Harrison, R. 2011. Surface assemblages. Towards an archaeology in and of the present. *Archaeological Dialogues*. **18**(02), pp.141–161.
- Harvey, D. 1990. Between space and time: reflections on the geographical imagination. *Annals of the Association of American Geographers*. **80**(3), p.418.
- Heim, M. 1998. *Virtual realism*. New York: Oxford University Press.
- Henderson, J.M. 2003. Human gaze control during real-world scene perception. *Trends in Cognitive Sciences*. **7**(11), pp.498–504.
- Henderson, J.M. and Ferreira, F. 2004. Scene perception for psycholinguists. In: J. M. Henderson and F. Ferreira. eds. *The interface of language, vision, and action: Eye movements and the visual world*. New York: Psychology Press, pp. 1–58.
- Hilgard, E.R. 1980. The trilogy of mind: cognition, affection, and conation. *Journal of the History of the Behavioral Sciences*. **16**(2), pp.107–117.
- Hine, C. 2000. *Virtual ethnography*. London: SAGE.
- Hochman, N., Manovich, L. and Chow, J. no date. Phototrails. *Phototrails*. [Online]. [Accessed 1 May 2014]. Available from: <http://phototrails.net/>.
- iFixit 2009. iPhone 3GS teardown. *iFixit*. [Online]. [Accessed 2 August 2012]. Available from: <http://www.ifixit.com/Teardown/iPhone-3GS-Teardown/817/1>.
- Ingold, T. 2008. Bindings against boundaries: entanglements of life in an open world. *Environment and Planning A*. **40**(8), pp.1796 – 1810.
- Internet Engineering Task Force 1996. RFC 1945 - hypertext transfer protocol -- HTTP/1.0. [Accessed 21 February 2013]. Available from: <http://tools.ietf.org/html/rfc1945>.
- Internet Engineering Task Force 1999. RFC 2616 - hypertext transfer protocol -- HTTP/1.1. [Accessed 21 February 2013]. Available from: <http://tools.ietf.org/html/rfc2616>.
- Jahoda, G. 1970. *The psychology of superstition*. Harmondsworth: Penguin.
- JEITA 2002. Exchangeable image file format for digital still cameras: exif version 2.2. Available from: <http://www.kodak.com/global/plugins/acrobat/en/service/digCam/exifStandard2.pdf>.
- Jenkins, H. 2006. *Convergence culture where old and new media collide*. Fredericksburg:

New York University Press.

- Jensen, O.B. 2009. Flows of meaning, cultures of movements – urban mobility as meaningful everyday life practice. *Mobilities*. **4**(1), pp.139–158.
- Kalin, J. 2013. Remembering with rephotography: a social practice for the inventions of memories. *Visual Communication Quarterly*. **20**(3), pp.168–179.
- Kamber, S. and Stampely, D. 2013. *In re iPhone application litigation* [Online]. San Jose Division, Northern District of California. Available from: <http://www.mainjustice.com/wp-admin/documents-databases/-1-Apple-Aug.-20-motion-supporting-class-cert.pdf>.
- Kinsley, S. 2012. Futures in the making: Practices for anticipating ubiquitous computing. *Environment and Planning A*. **44**(7), pp.1554–1569.
- Kittler, F.A. 1990. *Discourse networks 1800/1900*. Stanford, CA: Stanford University Press.
- Kittler, F.A. 1995. There is no software. *CTheory*. **10**(18), p.1995.
- Kittler, F.A. 1999. *Gramophone, film, typewriter*. Stanford, CA: Stanford University Press.
- Klein, H.K. and Kleinman, D.L. 2002. The social construction of technology: structural considerations. *Science, Technology & Human Values*. **27**(1), pp.28–52.
- Kolawole, E. 2013. About those 2005 and 2013 photos of the crowds in St. Peter's Square. *The Washington Post - Blogs*. [Online]. [Accessed 14 November 2013]. Available from: [http://www.washingtonpost.com/blogs/innovations/post/about-those-2005-and-2013-photos-of-the-crowds-in-st-peters-square/2013/03/14/aaf1067a-8cf9-11e2-9f54-f3fdd70acad2\\_blog.html](http://www.washingtonpost.com/blogs/innovations/post/about-those-2005-and-2013-photos-of-the-crowds-in-st-peters-square/2013/03/14/aaf1067a-8cf9-11e2-9f54-f3fdd70acad2_blog.html).
- Kreil, M. 2011. Combining crowdsourced geodata. *crowdflow.net*. [Online]. [Accessed 2 April 2014]. Available from: <http://crowdflow.net/>.
- Kumar, N. 2014. Repetition and remembrance: the rephotographic survey project. *History of Photography*. **38**(2), pp.137–160.
- Kwan, M.-P. 2002. Time, information technologies, and the geographies of everyday life. *Urban Geography*. **23**(5), pp.471–482.
- Latham, A. 2004. Researching and writing everyday accounts of the city: an introduction to the diary-photo diary-interview method. In: Knowles, C and Sweetman, P. eds. *Picturing the social landscape: visual methods in the sociological imagination*. London: Routledge.
- Latour, B. 1999a. On recalling ANT. Actor network theory and after. *J. Law and J. Hassard. Oxford, Blackwell Publishers/The Sociological Review.*, pp.15–25.
- Latour, B. 1999b. *Pandora's hope: essays on the reality of science studies*. Cambridge, MA: Harvard University Press.
- Latour, B. 2005. *Reassembling the social: an introduction to actor-network-theory*. Oxford: Oxford University Press.
- Latour, B. 2007. Can we get our materialism back, please? *Isis*. **98**(1), pp.138–142.
- Latour, B. 2008. The power of facsimiles: a Turing test on science and literature. In: Burn, S.J. and Dempsey, P. eds. *Intersections: Essays on Richard Powers*. Champaign, IL: Dalkey Archive Press, pp. 263–292.

- Latour, B. 2011. Networks, societies, spheres: reflections of an actor-network theorist. *International Journal of Communication*. **5**, pp.796–810.
- Latour, B. and Weibel, P. 2005. *Making things public: atmospheres of democracy*. Cambridge, MA: MIT Press.
- Latour, B. and Lepinay, V.A. 2009. *The science of passionate interests-an introduction to: Gabriel Tarde's economic anthropology*. Chicago: Prickly Paradigm Press.
- Latour, B., Jensen, P., Venturini, T., Grauwin, S. and Boullier, D., 2012. 'The whole is always smaller than its parts'—a digital test of Gabriel Tardes' monads. *The British Journal of Sociology*, **63**(4), pp.590-615.
- Law, J. 1999. *Actor network theory and after*. Oxford: Blackwell/Sociological Review.
- Layar 2012. Layar platform overview. *Layar Developer Documentation*. [Online]. [Accessed 3 September 2012]. Available from: <http://www.layar.com/documentation/browser/layar-platform-overview/>.
- Layar 2013. Layar API documentation. *Layar Developer Documentation*. [Online]. [Accessed 11 November 2013]. Available from: <https://www.layar.com/documentation/browser/api/>.
- Lévy, P. 1998. *Becoming virtual: reality in the digital age*. Cambridge, MA: Da Capo Press.
- Licklider, J.C.R. 1960. Man-computer symbiosis. *Human Factors in Electronics, IRE Transactions on*. (1), pp.4–11.
- Licklider, J.C.R. and Clark, W.E. 1962. On-line man-computer communication *In: Proceedings of the May 1-3, 1962, spring joint computer conference* [Online]. ACM, pp. 113–128. [Accessed 15 May 2014]. Available from: <http://dl.acm.org/citation.cfm?id=1460847>.
- Lüders, M. 2008. Conceptualizing personal media. *New Media & Society*. **10**(5), p.683.
- Lytro Inc. no date. LYTRO, Inc. *Lytro*. [Online]. [Accessed 12 February 2013]. Available from: <https://www.lytro.com/camera>.
- Malinowski, B. 1961. *Argonauts of the western pacific. An account of native enterprise and adventure in the archipelagos of Melanesian New Guinea*. New York: Dutton.
- Malinowski, B. 1989. *A diary in the strict sense of the term*. New York: Harcourt, Brace & World Inc.
- Manovich, L. 2001. *The language of new media*. Cambridge, MA: The MIT Press.
- Manovich, L. 2008. *Software takes command*. Unpublished. <http://lab.softwarestudies.com/2008/11/softbook.html>. [Online]. [Accessed 22 September 2013]. Available from: [http://black2.fri.uni-lj.si/humbug/files/doktorat-vaupotic/zotero/storage/D22GEWS3/manovich\\_softbook\\_11\\_20\\_2008.pdf](http://black2.fri.uni-lj.si/humbug/files/doktorat-vaupotic/zotero/storage/D22GEWS3/manovich_softbook_11_20_2008.pdf).
- Marcus, G. and Fischer, M.M.J. 1986. *Anthropology as cultural critique: an experimental moment in the human sciences*. Chicago: University of Chicago Press.
- Marquez, G.G. 2009. *One hundred years of solitude*. London: Penguin Books.
- Massey, D.B. 2005. *For space*. London: SAGE.
- Mattern, S. 2011. *Everything is infrastructure*. OOOIII: The Third Object-Oriented Ontology Symposium, 15 September 2011, New York.

- Mattern, S. 2012. *Deep time of media infrastructure*. 52nd Annual Society for Cinema and Media Studies Conference, 21-25 May 2012, Boston.
- Mayer, J.D. 2003. Structural divisions of personality and the classification of traits. *Review of General Psychology*. Vol 7(4). 7, pp.381–401.
- Meillassoux, Q. 2010. *After finitude: an essay on the necessity of contingency*. London: Bloomsbury Academic.
- Mendelsohn, B. no date. Bundled, buried and behind closed doors. [Accessed 15 November 2011]. Available from: <http://benmendelsohn.com/2011/10/17/bundled/>.
- Meta 2013a. Meta - preorder now. [Accessed 5 November 2013]. Available from: <https://www.spaceglasses.com/buy>.
- Meta 2013b. Meta - technology. [Accessed 5 November 2013]. Available from: <https://www.spaceglasses.com/technology>.
- Michael, M. 2012. De-signing the object of sociology: toward an 'idiotic' methodology. *The Sociological Review*. 60(S1), pp.166–183.
- Militello, L.G., Gentner, F.C., Swindler, S.D. and Beisner, G.I. 2006. Conation: its historical roots and implications for future research. In: *IEEE International Symposium on Collaborative Technologies and Systems. CTS 2006*, pp. 240–247.
- Morton, T. 2010. Thinking ecology: the mesh, the strange stranger, and the beautiful soul. *Collapse Vol. VI: Geo/Philosophy*. VI, pp.265–293.
- Morton, T. 2011. Objects as temporary autonomous zones. *Continental*. 1(3), pp.149–155.
- Morton, T. 2012. *The ecological thought*. Kindle Reprint edition. Cambridge, MA: Harvard University Press.
- Mosco, V. 2004. *The digital sublime: myth, power, and cyberspace*. Cambridge, MA: MIT Press.
- National Aeronautics and Space Administration 2010. Navigator technology takes GPS to a new high. [Accessed 1 July 2011]. Available from: <http://www.nasa.gov/topics/technology/features/navigator-gps.html>.
- National Research Council 2012. *Continuing Kepler's quest: assessing air force space command's astrodynamics standards* [Online]. Washington, DC: The National Academies Press. [Accessed 18 May 2014]. Available from: [http://www.nap.edu/catalog.php?record\\_id=13456](http://www.nap.edu/catalog.php?record_id=13456).
- Neal, R. 2011. War against the iPhone's consolidated.db. [Accessed 5 February 2013]. Available from: <http://ryanneal.wordpress.com/2011/03/18/war-against-the-iphones-consolidated-db/>.
- Newcombe, N. and Huttenlocher, J. 2000. *Making space: the development of spatial representation and reasoning*. Cambridge, MA: MIT Press.
- Nicholson, S. 2010. *Combining analytic and evocative modes into a visual autoethnography*. Contemporary Ethnography Across the Disciplines (CEAD), 17 - 19 November 2010, Hamilton, New Zealand
- Nicholson, S. 2011. The complication and complexity of 'documentary' In: Peters, G. ed. *2011 Expanding Documentary Conference Proceedings*. Auckland, New Zealand:

- Auckland University of Technology, pp. 162–171.
- Nowotny, H. 2005. The increase of complexity and its reduction. *Theory, Culture & Society*. **22**(5), pp.15–31.
- Nye, D. 2006. *Technology matters: questions to live with*. Cambridge, MA: MIT Press.
- Odell, J. 2010a. Day twenty four: Tuba City to Peach Springs. [Accessed 14 December 2011]. Available from: <http://www.jennyodell.com/sample%20tba%20spread.jpg>.
- Odell, J. 2010b. Sequoia National Park. [Accessed 14 December 2011]. Available from: <http://jennyodell.files.wordpress.com/2010/02/6-sequoia.jpg>.
- Odell, J. 2010c. *Travel by approximation*. San Francisco: Blurb.com.
- Odell, J. 2010d. Travel by approximation « this is the blog. [Accessed 29 October 2011]. Available from: <http://jennyodell.wordpress.com/work/travel-by-approximation/>.
- Orlikowski, W.J. and Yates, J. 2002. It's about time: temporal structuring in organizations. *Organization Science*. **13**(6), pp.684–700.
- Oxford University Press no date. Vascular, adj. *Oxford English Dictionary Online*. [Online]. [Accessed 19 May 2014]. Available from: <http://www.oed.com/view/Entry/221635>.
- Paraguay, L. and Costa, P. no date. INmobility. [Accessed 2 May 2014]. Available from: <http://luisaparaguay.art.br/web/projects/inmobility/>.
- Parikka, J. 2008. Copy. In: M. Fuller, ed. *Software Studies: A Lexicon*. Cambridge, MA: MIT Press, pp. 70–77.
- Parikka, J. 2012. New materialism as media theory: medianatures and dirty matter. *Communication and Critical/Cultural Studies*. **9**(1), pp.95–100.
- Paul, R. 2011. The darknet project: netroots activists dream of global mesh network. [Accessed 8 November 2011]. Available from: <http://arstechnica.com/open-source/news/2011/11/the-darknet-plan-netroots-activists-dream-of-global-mesh-network.ars>.
- people9 2013. Meta smartphone. *Meta: SpaceGlasses*. [Online]. [Accessed 4 November 2013]. Available from: <http://www.spaceglasses.com/applicant/521>.
- Peters, P. 2006. *Time, innovation and mobilities: travel in technological cultures*. London: Routledge.
- Phillips, T. 2014. Near miss: the solar superstorm of July 2012. *NASA Science*. [Online]. [Accessed 24 July 2014]. Available from: [http://science.nasa.gov/science-news/science-at-nasa/2014/23jul\\_superstorm/](http://science.nasa.gov/science-news/science-at-nasa/2014/23jul_superstorm/).
- Pink, S. 2007. *Doing visual ethnography: images, media, and representation in research* 2nd ed. London: Sage Publications.
- Pink, S. 2008. An urban tour: the sensory sociality of ethnographic place-making. *Ethnography*. **9**(2), pp.175–196.
- Pink, S. 2009. *Doing sensory ethnography*. London: Sage Publications.
- Pink, S. 2011a. Amateur photographic practice, collective representation and the constitution of place. *Visual Studies*. **26**(2), pp.92–101.
- Pink, S. 2011b. Sensory digital photography: re-thinking 'moving' and the image. *Visual*



- Studies*. **26**(1), pp.4–13.
- Pink, S. 2013. *Digital visual ethnography: reconfiguring the ethnographic place*. International Visual Methods Conference 3 (IVM3), 2-6 September 2013, Wellington, New Zealand.
- Pink, S. and Leder Mackley, K. 2012. Video and a sense of the invisible: approaching domestic energy consumption through the sensory home. *Sociological Research Online*. **17**(1), p.3.
- Pold, S. 2008. Button In: M. Fuller, ed. *Software Studies: A Lexicon*. MIT Press Cambridge, MA, pp. 31–36.
- Powers, R. 2001. *Plowing the dark: a novel*. Kindle Edition. New York: Farrar, Straus and Giroux.
- QderoPateo Communications 2010. *QPC - Articulated naturality web* [Online]. [Accessed 18 May 2014]. Available from: <http://vimeo.com/14968828>.
- Raymond, E. 2003. Automagically. *Jargon File 4.4.7*. [Online]. [Accessed 10 May 2010]. Available from: <http://catb.org/jargon/html/A/automagically.html>.
- Redmond, S. and Vita, J. 2013. *Moving images: images of movement*. International Visual Methods Conference 3 (IVM3), 2-6 September 2013, Wellington, New Zealand.
- Reeves, S. 2012. Envisioning ubiquitous computing. In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, pp. 1573–1582.
- Rogers, E.M. 2003. *Diffusion of innovations* 5th ed. New York: Free Press.
- Saldaña, J. 2009. *The coding manual for qualitative researchers*. London: Sage.
- Sassen, S. 2002. Towards a sociology of information technology. *Current Sociology*. **50**(3), pp.365–388.
- Schwanen, T. and Kwan, M.-P. 2008. The internet, mobile phone and space-time constraints. *Geoforum*. **39**(3), pp.1362–1377.
- Sewell, B. 2010. *Apple inc.'s response to request for information regarding its privacy policy and location-based services*. Letter to Edward J. Markey and Joe Barton, 12 July 2010.
- Sholette, G. 2011. *Dark matter: art and politics in the age of enterprise culture*. London: Pluto Press.
- Simpkins, S. 1988. Magical strategies: the supplement of realism. *Twentieth Century Literature*. **34**(2), pp.140–154.
- Slack, J.D. and Wise, J.M. 2005. *Culture + technology: a primer*. New York: Peter Lang.
- Slashdot 2011a. DARPA proposes ripping up dead satellites to make new ones. *Slashdot*. [Online]. [Accessed 24 October 2011]. Available from: <http://hardware.slashdot.org/story/11/10/22/0420236/darpa-proposes-ripping-up-dead-satellites-to-make-new-ones>.
- Slashdot 2011b. Evaluating patent troll myths - slashdot. [Accessed 6 September 2011]. Available from: <http://yro.slashdot.org/story/11/09/05/2253230/Evaluating-Patent-Troll-Myths>.
- Slashdot 2011c. iPhone tracking ruckus ongoing. *Slashdot*. [Online]. [Accessed 26 April

- 2011]. Available from: <http://apple.slashdot.org/story/11/04/26/1758220/iPhone-Tracking-Ruckus-Ongoing>.
- Snow, R.E. and Jackson III, D.N. 1994. Individual differences in conflation: selected constructs and measures. In: *Motivation: Theory and research.*, pp. 71–99.
- Sohn, M. 2013. *Visitors take photos of Pope Francis as he speaks from the central balcony of St. Peter's Basilica at the Vatican* [Online]. Available from: <http://www.apimages.com/metadata/Index/APTOPIX-Vatican-Pope/88a86d0b231d4c3aa885d5382ce34a0d/1/0>.
- Sony 2010. Cyber-shot Handbook DSC-HX5V. San Diego, CA: Sony Electronics Inc. Available from: <http://pdf.crse.com/manuals/4172668121.pdf>.
- Star, S.L. and Ruhleder, K. 1996. Steps toward an ecology of infrastructure: design and access for large information spaces. *Information Systems Research*. **7**(1), pp.111–134.
- Sterling, B. 2010. Augmented reality: QPC – articulated naturalness web | beyond the beyond. *WIRED*. [Online]. [Accessed 18 May 2014]. Available from: <http://www.wired.com/2010/09/augmented-reality-qpc-articulated-naturalness-web/>.
- Tambiah, S. 1990. *Magic, science, religion, and the scope of rationality*. Cambridge, UK: Cambridge University Press.
- Taylor, J. 1997. The emerging geographies of virtual worlds. *Geographical Review*. **87**(2), p.172.
- Thornton, R.J. 1985. 'Imagine yourself set down...': Mach, Frazer, Conrad, Malinowski and the role of imagination in ethnography. *Anthropology Today*. **1**(5), pp.7–14.
- Thrift, N. 1999. The place of complexity. *Theory, Culture & Society*. **16**(3), pp.31 –69.
- Urry, J. 2002a. Mobility and proximity. *Sociology*. **36**(2), pp.255–274.
- Urry, J. 2002b. *The tourist gaze* 2nd ed. Thousand Oaks, CA: Sage Publications Ltd.
- Urry, J. 2003. Social networks, travel and talk. *The British Journal of Sociology*. **54**(2), pp.155–175.
- Urry, J. 2005a. The complexities of the global. *Theory, Culture & Society*. **22**(5), pp.235 –254.
- Urry, J. 2005b. The complexity turn. *Theory, Culture & Society*. **22**(5), pp.1 –14.
- Vinge, V. 1993. The coming technological singularity. [Accessed 10 May 2010]. Available from: <http://www-rohan.sdsu.edu/faculty/vinge/misc/singularity.html>.
- Vionnet, C. 2007. Photo opportunities. [Accessed 12 May 2014]. Available from: <http://www.corinnevionnet.com/site/1-photo-opportunities.html>.
- Wainwright, J. and Barnes, T.J. 2009. Nature, economy, and the space–place distinction. *Environment and Planning D: Society and Space*. **27**(6), pp.966 – 986.
- Warden, P. and Allan, A. 2011. Pete Warden iPhone tracker. [Accessed 5 February 2013]. Available from: <http://petewarden.github.com/iPhoneTracker/>.
- Wardrip-Fruin, N. 2012. *Introduction: computation as part of culture* [Online]. University of California Santa Cruz. Available from: <http://www.youtube.com/watch?v=v4u4gd0NVV0>.
- Wardrip-Fruin, N. 2013. Noah Wardrip-Fruin on 'Computation as Part of Culture' (Media

Systems). [Accessed 11 November 2013]. Available from: <http://eis-blog.ucsc.edu/2013/08/computation-as-culture/>.

- Wardrip-Fruin, N. and Mateas, M. 2014. *Envisioning the future of computational media*. The Center for Games and Playable Media, University of California Santa Cruz.
- Wellman, B. 2001a. Computer networks as social networks. *Science*. **293**(5537), pp.2031–2034.
- Wellman, B. 2001b. Physical place and cyberplace: the rise of personalized networking. *International journal of urban and regional research*. **25**(2), pp.227–252.
- Wilken, R. 2007. The haunting affect of place in the discourse of the virtual. *Ethics, Place & Environment*. **10**(1), pp.49–63.
- Winston, B. 1998. *Media technology and society a history: from the telegraph to the internet*. London: Routledge.
- Woolley, B. 1993. *Virtual worlds: a journey in hype and hyperreality*. London: Penguin books.
- Yale, M. and Vionnet, C. 2012. *Photo opportunities*. Heidelberg: Kehrer Verlag.
- Zamora, L.P. and Faris, W.B. 1995. *Magical realism: theory, history, community*. Durham: Duke University Press.

## Appendix 1.0 - The Technology of Macondo

The reckless imagination of Buendía has appeared throughout the thesis and so the basis for magical thinking about technology-enablement was never completely eliminated; not that there ever was any attempt to stifle wonder and marvel at the bizarre magics those contemporary gypsy descendants of Macondo report. This appendix is a return to Macondo to remind of the reckless imaginations and magical thinking which the interpretive framework developed in this thesis counteracts. Marquez' story is provided as backstory to the contemporary period of m.com/do.

The following tale of technology in Macondo has been compiled by extracting brief passages from One Hundred Years of Solitude by Gabriel Garcia Marquez (2009).

\* \* i \* \*

Macondo was a village of twenty adobe houses, built on the bank of a river of clear water that ran along a bed of polished stones, which were white and enormous, like prehistoric eggs. The world was so recent that many things lacked names, and in order to indicate them it was necessary to point.

\* \* ij \* \*

Every year during the month of March a family of ragged gypsies would set up their tents near the village, and with a great uproar of pipes and kettledrums they would display new inventions. First they brought the magnet. A heavy gypsy with an untamed beard and sparrow hands, who introduced himself as Melquiades, put on a bold public demonstration of what he himself called the eighth wonder of the learned alchemists of Macedonia.

He went from house to house dragging two metal ingots and everybody was amazed to see pots, pans, tongs, and braziers tumble down from their places and beams creak from the desperation of nails and screws trying to emerge, and even objects that had been lost for a long time appeared from where they had been searched for most and went dragging along in turbulent confusion behind Melquiades' magical irons. "Things have a life of their own," the gypsy proclaimed with a harsh accent. "It's simply a matter of waking up their souls."

Jose Arcadio Buendía whose unbridled imagination always went beyond the genius of nature and even beyond miracles and magic, thought that it would be possible to make use of that useless invention to extract gold from the bowels of the earth. Melquiades, who was an honest man, warned him: "It won't work for that."

\* \* iii \* \*

In March the gypsies returned. This time they brought a telescope and a magnifying glass the size of a drum, which they exhibited as the latest discovery of the Jews of Amsterdam. They placed a gypsy woman at one end of the village and set up the telescope at the entrance to the tent. For the price of five reales, people could look into the telescope and see the gypsy woman an arm's length away. "Science has eliminated distance," Melquiades proclaimed. "In a short time, man will be able to see what is happening in any place in the world without leaving his own house."

A burning noonday sun brought out a startling demonstration with the gigantic magnifying glass: they put a pile of dry hay in the middle of the street and set it on fire by concentrating the sun's rays. Jose Arcadio Buendía who had still not been consoled for the failure of big magnets, conceived the idea of using that invention as a weapon of war. Again Melquiades tried to dissuade him, but he finally accepted the two magnetized ingots and three colonial coins in exchange for the magnifying glass. Usula Buendía wept in consternation.

\* \* iv \* \*

The gypsy returned and gave Jose Arcadio Buendía a convincing proof of his honesty: he gave him back the doubloons in exchange for the magnifying glass, and he left him in addition some Portuguese maps and several instruments of navigation. In his own handwriting he set down a concise synthesis of the studies by Monk Hermann which he left Jose Arcadio so that he would be able to make use of the astrolabe, the compass, and the sextant.

Jose Arcadio Buendía spent the long months of the rainy season shut up in a small room that he had built in the rear of the house so that no one would disturb his experiments. When he became an expert in the use and manipulation of his instruments, he conceived a notion of space that allowed him to navigate across unknown seas, to visit uninhabited territories, and to establish relations with splendid beings without having to leave his study.

Suddenly, without warning, his feverish activity was interrupted and was replaced by a kind of fascination. He spent several days as if he were bewitched, softly repeating to himself a string of fearful conjectures without giving credit to his own understanding. Finally, one Tuesday in December, at lunchtime, all at once he released the whole weight of his torment. The children would remember for the rest of their lives the august solemnity with which their father, devastated by his prolonged vigil and by the wrath of his imagination, revealed his discovery to them: "The earth is round, like an orange."

Usula lost her patience with her husband. "If you have to go crazy, please go crazy all by yourself!" she shouted. "But don't try to put your gypsy ideas into the heads of the children."

Melquiades returned to set things straight. He gave public praise to the intelligence of a man who from pure astronomical speculation had evolved a theory that had already been proved in practice, although unknown in Macondo until then, and as a proof of his admiration he made him a gift that was to have a profound influence on the future of the village: the laboratory of an alchemist.

\* \* v \* \*

The rudimentary laboratory in addition to a profusion of pots, funnels, retorts, filters, and sieves was made up of a primitive water pipe, a glass beaker with a long, thin neck, a reproduction of the philosopher's egg, and a still the gypsies themselves had built in accordance with modern descriptions of the three-armed alembic of Mary the Jew. Along with those items, Melquiades left samples of the seven metals that corresponded to the seven planets, the formulas of Moses and Zosimus for doubling the quantity of gold, and a set of notes and sketches concerning the processes of the Great Teaching that would permit those who could interpret them to undertake the manufacture of the philosopher's stone.

Seduced by the simplicity of the formulas to double the quantity of gold, Jose Arcadio Buendía paid court to Usula for several weeks so that she would let him dig up her colonial coins and increase them by as many times as it was possible to subdivide mercury. Usula gave in, as always, to her husband's unyielding obstinacy. Then Jose Arcadio Buendía threw three doubloons into a pan and fused them with copper filings, orpiment, brimstone, and lead. He put it all to boil in a pot of castor oil until he got a thick and pestilential syrup which was more like common caramel than valuable gold. In risky and desperate processes of distillation, melted with the seven planetary metals, mixed with hermetic mercury and vitriol of Cyprus, and put back to cook in hog fat for lack of any radish oil, Usula's precious inheritance was reduced to a large piece of burnt hog cracklings that was firmly stuck to the bottom of the pot.

\* \* vj \* \*

When the gypsies came back, Usula had turned the whole population of the village against them. But curiosity was greater than fear, for that time the gypsies went about the town making a deafening noise with all manner of musical instruments while a hawker announced the exhibition of the most fabulous discovery of the Naciancenes. So that everyone went to the tent and by paying one cent they saw a youthful Melquiades, recovered, unwrinkled, with a new and flashing set of teeth.

Those who remembered his gums that had been destroyed by scurvy, his flaccid cheeks, and his withered lips trembled with fear at the final proof of the gypsy's supernatural power. The fear turned into panic when Melquiades took out his teeth, intact, encased in their gums, and showed them to the audience for an instant a fleeting instant in which he went back to being the same decrepit man of years past and put them back again and smiled once more with the full control of his restored youth.

Even Jose Arcadio Buendía himself considered that Melquiades' knowledge had reached unbearable extremes, but he felt a healthy excitement when the gypsy explained to him atone the workings of his false teeth. It seemed so simple and so prodigious at the same time that overnight he lost all interest in his experiments in alchemy.

\* \* vij \* \*

"Incredible things are happening in the world," Jose said to Usula. "Right there across the river there are all kinds of magical instruments while we keep on living like donkeys." Those who had known him since the foundation of Macondo were startled at how much he had changed under Melquiades' influence. That spirit of social initiative disappeared in a short time, pulled away by the fever of the magnets, the astronomical calculations, the dreams of transmutation, and the urge to discover the wonders of the world. From a clean and active man, Jose Arcadio Buendía changed into a man lazy in appearance, careless in his dress, with a wild beard that Usula managed to trim with great effort and a kitchen knife. There were many who considered him the victim of some strange spell. But even those most convinced of his madness left work and family to follow him when he brought out his tools to clear the land and asked the assembled group to open a way that would put Macondo in contact with the great inventions.

But Jose Arcadio Buendía did not concern himself with that when he found the sea after fourteen nights of travel plus another four days journey from the galleon. His dreams ended as he faced that ashen, foamy, dirty sea, which had not merited the risks and sacrifices of the adventure. "God damn it!" he shouted. "Macondo is surrounded by water on all sides." The idea of a peninsular Macondo prevailed for a long time, inspired by the arbitrary map that Jose Arcadio Buendía sketched on his return from the expedition. He drew it in rage, evilly, exaggerating the difficulties of communication, as if to punish himself for the absolute lack of sense with which he had chosen the place. "We'll never get anywhere," he lamented to Usula. "We're going to rot our lives away here without receiving the benefits of science."

\* \* viii \* \*

On a warm March afternoon Jose Arcadio Buendía interrupted the lesson in physics and stood fascinated, with his hand in the air and his eyes motionless, listening to the distant pipes, drums, and jingles of the gypsies, who were coming to the village once more, announcing the latest and most startling discovery of the sages of Memphis.

They were new gypsies, young men and women who knew only their own language, handsome specimens with oily skins and intelligent hands, whose dances and music sowed a panic of uproarious joy through the streets, with parrots painted all colors reciting Italian arias, and a hen who laid a hundred golden eggs to the sound of a tambourine, and a trained monkey who read minds, and the multi-use machine that could be used at the same time to sew on buttons and reduce fevers, and the apparatus to make a person forget his bad memories, and a poultice to lose time, and a thousand more inventions so ingenious and unusual that Jose Arcadio Buendía must have wanted to invent a memory machine so that he could remember them all.

In an instant they transformed the village. The inhabitants of Macondo found themselves lost in their own streets, confused by the crowded fair.

\* \* ix \* \*

"Melquiades is dead." Upset by the news, Jose Arcadio Buendía stood motionless, trying to rise above his affliction, until the group dispersed, called away by other artifices. The children had no interest in the news. They insisted that their father take them to see the overwhelming novelty of the sages of Memphis that was being advertised at the entrance of a tent that, according to what was said, had belonged to King Solomon.

Inside there was only an enormous, transparent block with infinite internal needles in which the light of the sunset was broken up into colored stars. Disconcerted, knowing that the children were waiting for an immediate explanation, Jose Arcadio Buendía ventured a murmur: "It's the largest diamond in the world." "No," the gypsy countered. "It's ice."

Jose Arcadio Buendía without understanding, stretched out his hand toward the cake, but the giant moved it away. "Five reales more to touch it," he said. Jose Arcadio Buendía paid them and put his hand on the ice and held it there for several minutes as his heart filled with fear and jubilation at the contact with mystery. Without knowing what to say, he paid ten reales more so that his sons could have that prodigious experience. Little Jose Arcadio refused to touch it. Aureliano, on the other hand, took a step forward and put his hand on it, withdrawing it immediately. "It's boiling," he exclaimed, startled.



But his father paid no attention to him. Intoxicated by the evidence of the miracle, he forgot at that moment about the frustration of his delirious undertakings and Melquiades' body, abandoned to the appetite of the squids. He paid another five reales and with his hand on the cake, as if giving testimony on the holy scriptures, he exclaimed: "This is the great invention of our time".

\* \* x \* \*

The gypsies returned once more. They were the same acrobats and jugglers that had brought the ice. Unlike Melquiades' tribe, they had shown very quickly that they were not heralds of progress but purveyors of amusement. Even when they brought the ice they did not advertise it for its usefulness in the life of man but as a simple circus curiosity. This time, along with many other artifices, they brought a flying carpet. But they did not offer it as a fundamental contribution to the development of transport, rather as an object of recreation.

One afternoon the boys grew enthusiastic over the flying carpet that went swiftly by the laboratory at window level carrying the gypsy who was driving it and several children from the village who were merrily waving their hands, but Jose Arcadio Buendía did not even look at it. "Let them dream," he said. "We'll do better flying than they are doing, and with more scientific resources than a miserable bedspread."

\* \* E N D \* \*

The novel *One Hundred Years of Solitude* continues but the contribution of this character ends when Marquez immobilises Buendía. The reckless imagination of Buendía becomes stuck perceiving each day as Monday until he smashes to dust his technology in a savage display of violence shouting fluently in an incomprehensible language (Marquez 2009, p.80-81). This thesis neither considers nor presents a dystopian imagining of technology despite this conclusion to the character Buendía. This project has always been concerned with the reckless imagining stimulated by media and/or technologies constructed upon immaterial and material infrastructures of which Augmented Reality is but one example. It is that sociological concern that has motivated this project and resulted in the antidote presented in this thesis as an alternative to dystopian or utopian imaginings without undermining the marvellous and the real of truly automagical technologies.

## Appendix 2.0 – Qualitative Coding of Interview Material

This section of the appendices covers the qualitative coding of informant interviews. As explained in the introduction to the thesis, the material from informant interviews has been reframed as an intertextual dialogue with the contemporary descendants of the original Gypsies of Macondo. Material from this appendix will be cited in-text as either (quote 1) for the numbered raw quotes in appendix 2.3 or (IV.1) for the numbered in vivo phrases from appendix 2.4.

Qualitative Coding is an analytical method focussed around what Saldaña (2009) outlines as a range of primary and secondary techniques. Coding has followed the coding techniques: Initial, Invivo, Simultaneous, and Theoretical (Saldaña 2009). The qualitative data analysis software product used for coding of interview material was ATLAS.ti.

Ten interviews were held with four informants to generate 11 hours 33 minutes and 09 seconds of audio material. Six of these interviews were semi-structured interviews following the interview protocol (see appendix 2.1). The other four interviews were based around a whiteboard diagramming exercise (see the guideline for this in appendix 2.2).

Coding has created focus within the interview questions that prompted informants to describe Technology or technologies and how they connect or combine. The reason for this focus within the full range of source material is to attend to the vocabulary of technologists when discussing technological phenomenon and not to be distracted by the particular details of a collection of named technologies. The focus has been achieved by selectively isolating from hours of general speech about technical topics what are seemingly to me, as an insider to their views, the potentially meaningful statements they offer in response to queries about technologies, connectivity and description. The coded subset is a selective reduction to 2 hours 24 minutes and 49 seconds (or 21%) of the original 11 hours 33 minutes and 09 seconds of audio material.

Initial coding has isolated a core set of quotations (see appendix 2.3) from semi-structured interviews that became quite wide ranging discussions about: self-reflections on roles and professional practice, experiences with actual named technologies, metaphorical explanation of how certain technologies work or might be explained. Initial coding has

reduced the 2 hours 24 minutes and 49 seconds of transcribed audio totalling 18,750 words down to 178 quotations totalling 7,103 words (38% of transcription). In-vivo coding has provided a subsequent layer of selection by isolating 350 phrases and words (5% of the word-count) from quotations selected during Initial Coding (compare appendix 2.3 and appendix 2.4).

## Appendix 2.1: Interview Protocol

<b>Introduction &amp; Formalities</b>		<i>Notes</i>
1.	<ul style="list-style-type: none"> <li>a. Raise information sheet and consent form. Key points are refuse, sensitivity &amp; confidentiality. Both sign-off.</li> <li>b. Format not Q&amp;A, instead a guided discussion. I will introduce very generally to avoid narrowing prematurely.</li> <li>c. Your memory &amp; initial reactions are good. No wrong answers.</li> <li>d. Intended outcome: insight into thinking beyond myself, of how can discuss and describe technologies.</li> </ul>	
<b>Discussion</b>		
2.	<ul style="list-style-type: none"> <li>a. Professional background: roles with reference to technologies.</li> <li>b. Notable professional AND life experiences that shaped your personal engagement with technologies.</li> </ul>	<i>Biographical, for comparison</i>
3.	<ul style="list-style-type: none"> <li>a. Tell me your first impressions of my project</li> </ul>	<i>Reverse brief as a bracketing</i>
4.	<ul style="list-style-type: none"> <li>a. An overview of project, beyond what the info sheet explained...</li> </ul>	<i>Refer to one pager</i>
5.	<ul style="list-style-type: none"> <li>a. technology what does it mean to you</li> <li>b. how do you use the word technology</li> <li>c. how about technologies, what does that word mean</li> <li>d. how do you use the word technologies</li> </ul>	<i>Terminology. Instigating semantic.</i>
6.	<ul style="list-style-type: none"> <li>a. <i>Now, to identify some technologies we'll refer to later....</i></li> <li>b. What kind of internet technologies are there?</li> </ul>	<i>Establish personal relevance, i.e. to level of electricity and aircon</i>
7.	<ul style="list-style-type: none"> <li>a. Now, want to talk about written descriptions of technology...</li> <li>b. ...what are your first thoughts or immediate reaction</li> <li>c. What kind of technology descriptions are there</li> <li>d. What would you say about the relevance of each</li> <li>e. ...relevance of each to whom</li> <li>f. How do written descriptions of technology feature in your experiences of technologies</li> <li>g. What advice would you give to a newbie [practitioner [type]] about interpreting documentation</li> <li>h. ...about creating</li> <li>i. What advice to me about interpreting documentation as I try study technologies</li> </ul>	<i>Hermeneutics</i>  <i>Uggh reaction?</i>  <i>Code/sys docs/ mkt speak/ community doc's/ reference/ manual/ diagrams etc/ comments</i>
8.	<ul style="list-style-type: none"> <li>a. When you need to explain technologies, how do you go about that</li> <li>b. ...any common or useful phrases you use</li> </ul>	<i>Narrative</i>  <i>i.e. The reality is, the problem is, it just works,</i>

- c. How would you explain the contemporary state of internet technologies, from a starting point back in the past *etc*  
*Genesis... episodic.*
- 9. a. How would you go about explaining to me internet technologies *Schematics & models*  
*Sub-cultural*
- b. How would you explain to a *user* a web server
- c. For 'me', knowing what you assume about me, explain a web server
- d. How would you explain a web server to a server admin with no web experience
- 10. a. *Now, returning to the different kinds of internet technologies...* *i.e. scenarios of use or resembling a story structure.*
- b. How do they connect *or* combine
- c. How do you suggest I represent <this>
- d. What phrases and language do you use or see used to refer to connected/combined technologies
- e. What sort of story format would best explain the combination ...to a layperson
- f. How do you simplify an explanation of connected and combined technologies... to the essential and relevant
- 11. a. *Now, to reconnect with some themes of my project...* *Socio-*  
*Tech in shadow of Science*
- b. How do people feature, in relation to technology/technologies/internet technologies *Am I problematising*
- c. Science and technology is a compound phrase used often, how do you explain the relationship between science and technology *Belief*
- d. Are the internet technologies we've talked about complicated
- e. ...individually or combined
- f. Do you know all you need to know about the technologies you deal with in your role and life ....areas of acceptable mystery?
- g. Technology, are you weary or excited by it ...were you ever...
- h. Specialness, are there examples of technology you think are wonderous, possibly even awestruck by

**Wrap-up & debrief**

- e. a. Did you reveal anything you're now apprehensive about, sensitive topics?
- b. Comfortable with words, language and meaning of what you said?
- c. My actions next: make notes, transcribe; then analyse.
- d. Next contact: *technology diagram and discussion*. Explain process.

## Appendix 2.2: Guideline for the Technology Diagram Activity

My research project examines how people use technology to create a sense of place.

The focus of this project is augmented reality browser software on a mobile device. A simple explanation of this technology is that digital content can be created to connect an information space with a geographical place. Figure 1 shows the augmented reality browser software 'Layar' on an iPhone. The on-screen display shows the New Zealand search engine 'Zenbu' identifying proximity, direction and information about a local place of interest. As demonstrated in figure 1, mobile internet technologies can extend the association between geographical places and information spaces creating a cyclic connection by presenting digital content layered into a visualisation of place. The nature of this cyclic loop is complicated by layers of technology and digital content.

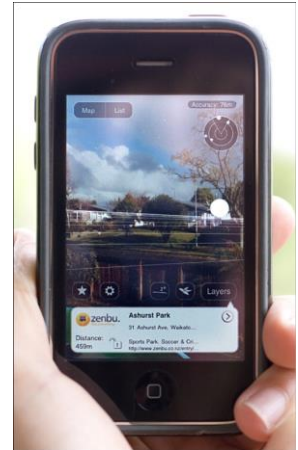


Figure 32 - Augmented Reality Technology

**Your task is to hand-draw one or more technology diagrams. The focal point is augmented reality browser software. The purpose of the diagram is to illustrate all dependencies based on your interpretation of what might be relevant technologies.**

What is of interest is how you attempt to record and explain combinations of technologies and dependencies when considering a single technology. I won't be reviewing correctness. You can Google or use any source of information if you choose to investigate this technology while diagramming its dependencies. Use blank A3 or A4 sheets of paper. Spend a minimum of 30 minutes on the drawing. Draw whatever elements you think relevant in whatever style that suits you. As a suggestion, consider referring to elements like the following in your diagram:

The Surrounding environment	A mobile device
Technology or technologies	Software
Connectivity and connections	Personal Computing
Electricity	Technical people
Satellites	Non-technical people
Networks	

*And then what...?* We'll meet to discuss the diagrams once you're done. I will ask you to explain the diagrams as you redraw them on a whiteboard.



### Appendix 2.3: Raw Quotations from Initial Coding

Table 2 below lists quotations selected during initial coding of passages from the interviews focusing on Technology and technologies, their connections and combinations and descriptions. Coding isolated 178 quotations from those broad topical areas totalling 7103 words. Quotes from this appendix are cited in-text (e.g. quote 1) to correspond to the numbered raw quotes in table 2.

Table 2 - Initial Quotations

Quote#	Atlas.ti Ref.	Initial Quote
1	1:1	I guess it's some advanced constructs so things that people make, to do something to suit some role
2	1:2	it's probably new, the idea of technology is that it is newish because after a while it stops being technology
3	1:3	variable valve timing on my car, that's technology now because its new
4	1:4	but an engine's not technology you know because you can get one in your lawnmower, it's not technology because it's not ... you know ...its established I guess, you think maybe the wheel was once technology but now it's not, it's just a building block
5	1:5	if it becomes so ubiquitous it's part of your life it's no longer technology like my vacuum cleaners not technology even though the motor in its probably been refined over several years for: suck, power, quietness, you know, all those things
6	1:6	so there's technology there, but people don't perceive it as technology
7	1:7	the idea of technology, it's the new stuff that solves problems
8	1:8	to refer to software hardware in my experience and probably again I wouldn't use technology to refer to say air conditioning system at work even though inside the air conditioning there's some pretty good technology
9	1:9	technology is most often used with advanced things that appear to be, I was going to say technological but, appear to be complicated or complex
10	1:10	technology, technologies... I wouldn't see a distinction between them
11	1:11	technologies, probably only thing that I'd say is the difference between technology and technologies or might be is that technologies might be derivative, or derivative's not the right word but, in your car you have technologies, and multidisciplinary things



12	1:12	so in a vehicle there are many 'technologies' but they're multidisciplinary, so they're not just computing, there's electrical, refrigeration technologies, there won't just be the same thing, the same basic ideas there
13	2:1	a prescribed kind of, facility, some sort tool that has a known, relatively known capability that you can depend on or um use to um perform certain functions that you know the technology may be applicable to might be kind of well prescribed and specified but could be something more open using it to build other technologies
14	2:2	could be a, might be um self-contained black box or a tool set
15	2:3	doesn't have to be sophisticated, could be very simple or very complex
16	2:4	it's not time based either is it, technology is something that we've had since we were cave man and it evolves with us, I guess, as our needs and expectations evolve
17	2:5	sometimes it's a synergistic thing so that we're able to do more than we could imagine or more than we imagined we would with the tool or technology and hopefully it leads on to better and more optimised technologies
18	2:6	usually I would speak in more specific terms about a standard or brand name or something proprietary or probably talking more specifically about a single technology in terms of its identity maybe rather than it being a generalised thing or a technology, I'd talk about it in its own terms
19	2:7	I tend to err on the side of caution, and be not, not be very specific about it if I'm not completely familiar with it
20	2:8	it's definitely some pretty broad collections of things that you might describe as a single technology, I guess, ...and I think you need to be pretty careful about understanding what all those things mean as a collection, it's pretty clear, I think when you see or hear somebody talking about something where they've not, apparently not, got a full complement of understanding
21	2:9	with something like a tweet you can be pretty obscure about a claim or statement that you make and other people can fill in the blanks whereas writing a paper for a conference or some sort of thesis you've got to be pretty specific or at least specific about what you are claiming to know
22	2:10	in terms of the kind of work that I do, I would think of it terms of um a collection of individual technologies that work in harmony or together or are applied as a collection rather than being a new technology
23	2:11	rather than a collection being a new technology, there's a collection of technologies I suppose where their purposes

		maybe aren't necessarily always aligned but you kind of lash them together for some other outcome that you're aiming for
24	2:12	Personal life, it'd be more specific to maybe devices that use technologies or appliances or something
25	2:13	Not very often, I wouldn't think, I think I would probably usually thinking about a specific technology, apart from that example of applying a bunch of them for some specific outcome
26	2:14	I'd usually be thinking of them as discrete things, rather than a collection, now that I think about it, I think it's pretty loose collection, loose association - a collection of disparate technologies pretty oddball um concept
27	2:32	be pretty specific or at least specific about what you are claiming to know
28	3:1	I think of something mechanical, I think of clocks steam engines pendulums, that sort of stuff, and maybe half a second later ... I start thinking okay, it's up software running on machines because that's my professional environment
29	3:2	it's a man-made automatable, or mechanism to do something either we can't do or would take us a long time to do or we just don't enjoy doing it
30	3:3	I have quite a broad understanding so I would include everything in here from the security infrared sensors that you have in homes and stuff um stuff inside your car even a crane I would include in my understanding of technology
31	3:4	the word technology seem foreign, seems to be, yeh, foreign when talking about software in essence when I think about it
32	3:5	talking about a bit of software or whatever... and I guess because I've been so heavily involved with software ...I see it in its own right and when I'm thinking of structured cabling or servers or whatever ... things I've been heavily involved in, I see them in their own right
33	3:6	technology is something broader, the majority of which I don't really understand so I understand how a crane manages to lift something to the top.... you know there's something Newtonian (?) going on there but yeah good on them, I don't understand how a key works in a lock
34	3:7	I very rarely use the word I think because I like to be more specific
35	3:8	I use the word technology around that because everyone understands were talking about something technical something um, something's that's ... a system that's, whether its software or real or mechanical or range of different things, there's software, there's radio frequencies going on, there's networking going on, and it covers a range of different entities

		so technology is a nice umbrella to that
36	3:9	I know if I say to my business user um wow we've got this new technology etc etc then it frames their mind, if I say we've got a new software or a new communications device it means something different to them but I can stay vague by talking about the word technology and as I talk about different elements that I want to get information out of them or into them then I can drill down to those more specific areas and so it frames conversations
37	3:10	something that's probably electronic, probably new, there's an element of newness to the word as well, so we've got a technology
38	3:11	something new comes along, so that's where I'd use it, but wherever I can I'd go into a more specific, because it has a better meaning
39	3:12	Technologies, um, ... arr, again this is where I'm hugely inconsistent, technologies to me mean, a range of products, typically software
40	3:13	a range of products so a technology that would fit within a technologies group would be a bit of software
41	3:14	maybe there's things behind that but largely when people say, we've got a range of technologies that would help us, right what software package are we talking about, and then it may grow into something that's more than software
42	3:15	I'm also thinking of the users engagement with it so there may be a raft of "technology" but when we say we have these technologies I'm usually thinking right, it's at the point at which the user engages with it
43	3:16	I very rarely use it, to be honest, um, again because it's not particularly specific, and as soon as I, I often find, largely in my professional life, um, where as soon as we start talking about um, technologies, then we need to get specific really quickly, we need to identify which and to what technologies we're talking about and then very quickly we need to start talking about the user engagement, the database server, the business redundancy, all that sort of stuff, and so I spend extremely little time at the top end and as soon as I can, even if it means educating the people I am speaking to quite briefly then I try and get down a bit lower because it means a lot more and we have a much more meaningful conversation
44	4:1	it's essentially human creations that automate or make work easier or make tasks easier
45	4:2	probably the general understanding in the way that I use it, is very much that it doesn't include things that are totally ubiquitous

46	4:3	a pair of scissors is technology but I'm not sure we'd sort of count it in the space of technology necessarily
47	4:4	it's generally things that I guess we kind of consider to have some novelty and perhaps the workings of it are sort of complex beyond what simple inspection could reveal
48	4:5	a phone is technological and perhaps a pair of scissors while being technological is sort of not what we consider the space of technology
49	4:6	there's some complexity qualifier there I guess, both a ubiquity and a complexity one
50	4:7	for example 'information technology' which is very sort of loaded term, I tend to not use that one
51	4:8	technology in general, I mean I think I would use it to cover the space of electronic devices
52	4:9	things that enable, enable automation in some sense, but particularly things like communications technology they perhaps get conflated a little bit
53	4:10	by my own qualification, like a desk fan is electronic and quite complicated but it's not, ah it is technological but what's again I'm not sure I'd consider it in the space of 'technologies'
54	4:11	I probably use technology to mean high-tech in the kind of traditional economic market segment sense of you know things like computers phones software
55	4:12	those kinds of enabling communications technologies as much as anything
56	4:13	there's an implied frame of reference, when I say technology, I'm a computer scientist so it probably doesn't stray too far from that
57	4:14	they're kind of appliances or something
58	4:15	that's what I meant by the ubiquity that whereby they're so run of the mill and just considered so kind of ordinary that we wouldn't sort of consider them to be technology even though they clearly are
59	4:16	probably the breadth and scope of it is not really appreciated by the kind of lay person because a lot of the things we would consider technology are, you know, hidden, in a sense that the wires are in the walls and the switches are in the network cabinet and all the amazing technological processes that kind of actually make Farmville run
60	4:17	the sense where there's so much behind the scenes which is technology but because I don't think, if you weren't kind of working in that space, I don't think you'd ever have any exposure to it essentially except sort of the end result of it, it's sort of a very different view of it

61	4:18	you see the end result of all this huge amount of complexity
62	4:19	there is a sense in which most people don't know and don't care about that complexity, and that's quite fair and valid you know, it doesn't make people's lives better necessarily to know anything about how stuff works because it works you know
63	4:20	usually unless people are clearly interested and asking the specific thing or discussing the specific point
64	4:21	usually it only comes up when technology is malfunctioning essentially
65	4:22	if everything goes smoothly, people don't talk about technologies in those terms
66	4:23	if you think of something like Facebook, I know a lot about how Facebook works behind the scenes and the technologies that enable it but, um, in my everyday life, if we're kind of talking about the technology like Facebook, then you don't talk about how it works, you only talk about 'I did this on Facebook or whatever' whereas when I'm with a computer science cohort it's much more likely to talk about the operation of it
67	4:24	it would only be if Facebook wasn't working, then perhaps I'd probably have a much better idea of why it's not working, it might be some behaviour manifesting
68	4:25	most people don't care about that level of detail
69	4:26	I usually just abstract some level of detail and try and do it by analogy
70	4:27	it is not helpful to a layperson to sort of have somebody dump a huge amount of detail on them unless they have a specific interest in learning something about it
71	4:28	you're going to have to agree with three sort of layers of premises before you get to the point where it might have it might have a motivation, you have to know there's this thing called software, and you sort of have to know there's a problem with its construction, and you sort of have to know there's a problem with the way we manage the problem with its construction, and then you sort of get to my project
72	4:29	that's where I usually abstract it away to only the first or second layer; 'so there's this thing called software, and sometimes there's problems creating it and those cause bad things like airplanes drop out of the sky and aircraft control systems go haywire', I always use the aircraft as the thing because people to want those to go wrong
73	4:30	I use the fear-uncertainty-doubt argument, working in IT has taught me a few things

74	4:31	when I use the word of technology there is an implied frame, I think it is possibly the universe of possible frames
75	4:32	technologies is probably what I would consider all of those definitions, encompassing the wider space, slightly but still probably leaving appliances out
76	4:33	I have a hard time considering a refrigerator technology, I don't know why, it's sort of a silly cognitive dissonance
77	4:34	I think they probably include technologies but probably in the bits we don't understand you know, ... there's probably fuel injection technologies for example but I'm not sure there's radiator technologies
78	4:35	And in my use of most technologies, even though I may understand quite a lot about them I prefer not to kind of let that inform how I use them too much
79	4:36	technologies is a wider term
80	4:37	there's still some notion in which you can kind of replace the word technologies with 'magics' and technology with the singular form and perhaps that would sort of be a fair characterisation of how I use technology, it's all the bits that are kind of magical ... and so, I guess technologies is a slightly wider classifier for all these different kind of forms of bizarre magic that go on in our everyday lives
81	4:38	the taxonomic implications bizarre, I have never really thought of my own usage of the term in that I very much probably use a laypersons definition despite being aware of the complexity
82	4:39	when I encounter that complexity I certainly go 'wow that's kind of magical' even though I understand it down to the wires, I still go 'that's pretty magic'
83	4:40	I was having discussion with somebody about the way they build microchips which was something I'd never thought about but they like grow silica crystals and like dope it with boron like one atom thick, I was going, you know that's a fully straightforward chemical process but by god there's something magical going on there, I would not have thought of doing that
84	4:41	that's bizarre in a sense that these things are so horrendously complex but then they kind of, the feed-on effects are so ubiquitous
85	4:42	the technologies are all these things that, despite all these things being quite ubiquitous, have this very very huge degree of complexity behind them, kind of motivating them or enabling them
86	5:1	communications now the main thing, because the only thing that's common is that they communicate over the internet and

		that the internet is exposed in so many different places now, so, you can get it via your phone, wireless, over wireless USB stick, you can, so basically its access to a channel, and then things hang of the channel
87	5:2	originally it was server-centric, so you had a web server, but really it's about access to the internet, and you know you're not, from a user point of view you don't even look at the... what
88	5:3	so it's not one of those things suddenly you have to get yourself an internet connection, you're always connected somehow, this technology, it's more about access, communication through a channel, rather than the end point
89	5:4	You'll find it on the Net somewhere or on the web, and I'd not make a distinction that on the web is on a web server, just on the Net means you can get to it from anywhere and it might be something that's hosted on a web service or just like a service listing on the web like NTP, that would be it
90	5:5	I think people understand what the Web means, they might not understand the same way for them the web might just be the internet whereas I understand the Web to be a web service
91	5:6	you wouldn't distinguish between on the internet and the web or any of that, because you know that probably the only way they're ever going to be able to access it is going to be on the web
92	5:7	It only comes up if they've got some thing like they've got a USB stick like that which doesn't get connected, then you're going, 'well you're not connected to the Net to get to that web site to update your..' cause a classic is Microsoft updates, you might not start a web browser because it automatically happens in the background you don't do anything with it, when you get the thing saying that there's someone wants to talk to you on instant messenger, well that's not a web service that's just network service but I don't want to make the distinction, why confuse people
93	5:8	A lot of the time it's about software problems, things that go wrong with software, and it might be that you're using it incorrectly or there is a genuine problem, and there's situations where, particularly where you don't understand what the problem is either
94	6:1	what sort of context it was might have an impact on how you might describe it, so if I am talking to a teammate about something, and maybe they're interested in the way two different technologies are interacting or interchanging information, behaviour or state or something but for somebody who's not, is maybe more interested in the deliverable works with those technologies it's probably more

		about the experience rather than the technology itself
95	6:2	the conversation turned around to be more about how he performs his testing role and then just sort of filled in the blanks based on that, and that was a reasonably complex suite of things, so like a flash application wrapped in a web page, a testing tool written in .NET using a JS API to talk to a Flash API that was talking to the Flash object in the web page, so you've got C# you've got .NET runtimes you've got a .NET library that's facilitating the talking to the Flash component, the Flash interface, you've got a distributable that comes out of the .NET library that can be run independent of it or Visual Studio as a sort of IDE and then, none of these things he was using himself, the end result was this runtime that talks to the application, and the application in this case is a Flash object in a web page
96	6:3	so there's all these abstractions so the JS interface was the target interface for anybody that wanted to introduce some other language to do the testing, the Flash object exposes certain things natively that you can test anywhere yourself, but, this additional Flash library supported probing a bit deeper and so we just talked about that, but it was more about trying to relate things to how he was doing testing in the web, for web functional testing
97	6:4	so that was quite a collection of different tools I suppose, but if I was talking to one of the other developers there um, we'd probably be focusing more on the interaction between each one of those layers rather than how to write a test which is what the testing guy was interested in
98	6:5	there were obstacles along the way for that, the, um, the Flash API is a Google code project, in the Google code repository project that started off in Sourceforge, a small team of people who built this thing and was last modified in September of last year, so has stagnated, no documentation, the only documentation is in the code, on their web site they've got "go to our wiki for information" you go to the wiki there's nothing in the wiki, they've got a mailing list and it's just full of questions from semi-technical people saying "I've downloaded this thing and it doesn't work for me, can anyone give me any pointers" and just dead-ends, it's working and it's a useful solution but there's no information about it, other than looking through the code which is kind of frustrating
99	6:6	it's reasonably well documented
100	6:7	we'd be more likely to jump on the whiteboard and sketch up a bit of an architectural kind of diagram of some sort
101	6:8	probably look at if there's a page that lists a bunch of API calls or something, probably quickly glance at those, definitely look at a few discrete bits of code at each layer to see how a sample call would work, right from the looking at the app and



		determining what the expectation is or the functional thing is you're testing all the way back to that .NET IDE where you're typing, compiling, building, deploying, running, witnessing the result, um, annd, also talking about the technical, with the programmer type we'd be particularly looking at gotchas like I always consciously keep a list of things that didn't behave the way that I thought they would have when I was using something that claims to work in a particular way and doesn't appear to
102	6:9	the test guy wouldn't be at all interested in that
103	6:10	talking to the project manager, they're more likely to want to hear something like along the lines of what the test guy had but at a higher level, um, they might be concerned about licensing and um, impact on the performance of the thing or customer perception
104	6:11	they might be interested in maintenance or complexity, at resourcing if I left and somebody else had to start writing tests using that sort of convoluted approach, um, they'd be maybe concerned about the fact that that tool hadn't been mod... maintained since September 2009
105	6:12	me and the other developer would know that, from looking at the API and using it that it actually does what we need to do
106	6:13	I don't know, would you bother? Not sure. You'd definitely, as alluded to before, you'd look into the black box where possible, and if they probe, open the conversation up
107	6:14	I'm okay at describing things to her, or to a layperson in general, but it's quite, you know it's pretty overwhelming, I think a lot of the stuff, that kind of layering is, just seems to alien
108	6:15	I think the reaction is just that 'well why does it have to be so complex'
109	6:16	your natural reaction is to push back against complexity when it should be simple but the trade-offs of a more complex system like that means that you've got isolated points of responsibility and you don't have to write the whole system, you're only writing one element of it in a lot of cases
110	6:17	like take this testing system, all I'm doing in practice is writing .NET, everything else is just configuration, it's getting libraries in place, its um, including them at each point along the way, which is just configuration, it's not coding, um, its binding in runtimes and things, to both the web and IDE, its loading support libraries, its configuring parameters for the compiler and stuff, it's just configuration, the actual tests for this example is just ten lines of .NET, you know C# or something, to check that a component behaves in a certain way, everything else is handled by all this hard work that somebody else has done

111	6:18	I'd probably naturally tend to provide more, too much detail, which is not helpful if you're trying to describe the bigger picture
112	6:19	this whole idea of embracing something you know you don't completely understand it and using it, just moving, using it, and moving on, doing what you need to do without having to have complete comprehension of it, that's the case with this exact situation, this scenario that I've just mentioned, that is the exact case, I've never done any .NET work before in my life, this week is the first week that I've touched Visual Studio
113	6:20	when you're talking to a layperson, you can um, talk more about concepts and things, about even for tools and technologies that you're really not that familiar with, because you know what part they play, you don't necessarily know exactly how they're doing it
114	7:1	I think in terms of access, so I think in terms of, I generally try to treat the internet as just a big cloud of connections and magic and information and sources
115	7:2	behind that there's a whole bunch of people entering stuff in, or around it rather
116	7:3	I think in access points, so my primary connection is where does the user connect into the internet, and that would include the device, so I'd probably start thinking about device initially, and then I'd start thinking about the sort of application
117	7:4	when we talk about connections my mind goes to the physical path of what's going on
118	7:5	my connection thought is largely around the user accessing this pool through the medium of a device
119	7:6	combinations of...Nah I don't really think,... it's not a type of thinking, a thing I usually consider
120	7:7	unless we're thinking about actually developing some internet technology, and then we might say I need a database, a web browser, a web server, you know, this that and the other in order to bring together the whole package
121	7:8	my view is primarily on the user, then the user doesn't see that, they're not concerned with that, they just see the end product, and in product land these things are largely independent
122	7:9	I would probably talk about the ways those different elements contribute to their experience, so I'd say um, you see a web page in front of you, that's put together and created in real-time, I'd probably use the word real-time because I think a lot of people understand that in a general sense, but I'd probably use the word web server just to be specific and to put that, to

		encapsulate what's going on in it, but that draws on bits of information so I might get a bit of text from another web server and I might get a bit of audio from a database, um, and collect those things together, and I'd use human activity, so I'd use words like collect, or combine rather than engineer or render or those sorts of words, those elements together and puts them together in a single web page then they know what we talk about because they can see it and then it pushes it through the internet to your computer
123	8:1	How they connect or combine, so there's kind of these, there's the buzzwords which, as much as we all kind of loath them, they are quite useful as descriptive things because they become these wonderful nouns that actually hide so much complexity, so you can say SOAP, REST and Web Services, and Service Oriented Architectures.
124	8:2	these wonderful nouns that actually hide so much complexity, so you can say SOAP, REST and Web Services, and Service Oriented Architectures
125	8:3	in of themselves they have a huge amount of connotation attached and things but they kind of hide all that
126	8:4	you can talk about the idea that there's all these protocols that govern how one web server may talk to another to retrieve some additional information and can invoke a service on another computer to sort of perform a task which it itself can't perform
127	8:5	mashups or its very much an enterprise flavour because enterprise software tends to be composed of many different parts bought together into a monolithic entity
128	8:6	the terminology of software engineers, its objects, classes, its remote procedure invocation, and capabilities based security, once again very loaded terms which have a lot of connotations behind which are used to hide that detail in a sense of combining disparate technologies
129	8:7	tends to be the domain of programmers, and so you use the programmers technology or the software architects terminology, separation of concerns for example, and it's very much architecture so we talk about design patterns and things, well we're going to use the Proxy design pattern to remotely invoke this bit of the system, or this is distributed systems so we're going to use these kind of design patterns
130	8:8	people pull them out, they do them intuitively then design patterns are overlaid as concepts
131	8:9	I approach that as a programmer because that was sort of my world for a long time because my world for a long time was exactly those terms, you know pulling together 15 different bits, plugging them together, that's what most programming is in commercial environments

132	8:10	programmer is an umbrella term for many different types of activities, and some programmers will never touch the full generality of those activities, some may stick to one type of programming activity
133	8:11	certainly a lot of commercial programming does tend to be pulling together disparate elements that kind of hide the complexity
134	8:12	software libraries, tend to be things which you might be able to implement yourself but it'd be hard work and you may not be able to implement them yourselves, maybe way too much involved and so you kind of just grab the library and, you use it and you never really have to look inside it, so that's what I mean, it's that component based approach, it's sort of like, here's a library for this, a library for this, now I write the glue code that kind of puts them together
135	8:13	there are other people creating those bits, people churning out libraries, and they may only be used internally but there's kind of a select number of people doing the heavy lifting, may be small s/w teams, or these big open source efforts
136	9:1	there's two, ones complete bullshit, we've got this super-duper blahdeblahdeblah ...and the other is, you know, 14 tomes of technical documentation which don't describe the product in any way but describe it intimately
137	9:2	back to this idea of RFCs, so you've got this RFC on how telnet works, say, and it describes intimately, you know, a packet goes this way and a packet comes this way, the links established, blah blah blah, that if you're a geek it's fantastic, but if you're a user you're never going to read that
138	9:3	marketing description of something technical, so really they're selling the dream 'stay in touch with your friends blah blah blah blah, they're not going to tell you that it's got this sort of thing
139	9:4	it doesn't support NTFS file systems, it doesn't support folders, and so I guess if I'd trolled through the lengthy manual, this tome, I would have found that out, but I just saw 'USB' and it said 'record this many hours' and so you get the features and think 'yeh, that'll do me, that's fine'
140	9:5	if you really want to know about technology you go to the ultimate reference, the build guide, and the other side is the bullshit, the marketing guide, and somewhere in the middle is what you actually want
141	9:6	this idea of code and comments, I honestly think the world is becoming less coder and more application
142	9:7	that's what most people are working with now, they're working with quite large atomic building blocks

143	9:8	you get the people who do the low level stuff but I don't think you get as many people who do that anymore, the percentage of people that use computing, so you've probably got more coders than there used to be in my early days, where you had to be a computer science person or an earth scientist who wanted to do particular... now I think with Windows C#, say, you might find there is a hell of a lot more programmers in there, but they do a certain amount of things, but the number of people doing other technical things, like web pages for instance, where they're just taking a template and expanding it out, there's no technologies, no discipline around what they do, they just do it, and they remember, they don't code or comment or anything, if it doesn't work they build another thing
144	9:9	the whole idea with say comment in and code is that if it gets large enough that things are going to get obscure, that someone can't work it out, that's where you shove comments in, and a bit of documentation you do this and something happens, but I think a lot of content that is created now is not vast, atomic is not the right word for it but you know it's like a building block of some thing
145	10:1	usually specifications I suppose. Thousands of pages of dry stuff, bit of maths, and um, I dunno, lots of references, ... web stuff gets a lot of commentary, you know, people will write about a standard I suppose and they'll comment on how it might be implemented or used but the actual technical specifications themselves
146	10:2	personally I don't refer to them a great deal I don't think, I guess you, probably deal more with the way somebody, the documentation that somebody publishes for an implementation of a technology based on the standard or the technical spec, so I'd probably show more interest in how Firefox handles HTML 5 versus what's actually in the HTML 5 spec
147	10:3	take say DTD's for example, who the hell reads a DTD
148	10:4	there's no way I will ever be looking at a specification for an encoding method or algorithm but I might be interested in things like refresh rates or resolutions or dimensions, more profiles of technology, a sort of snapshot of technology, to do with how I am using it
149	10:5	it's a pretty common thing to now you see much more of that to with really heavy technical specifications, they do tend to abstract things away into profiles
150	10:6	there might be kind of vendor specifications for how they implemented things
151	10:7	could be kind of use-cases that might outline how they are relevant in certain circumstances of, for certain users or uses

152	10:8	critiques of the technology I guess by you know professionals or analysts
153	10:9	I'm personally more likely to encounter technical writing about the technology through a Blog or a magazine or something that's assessing something to see how relevant it is or what sort of fit it has to a certain need
154	10:10	critiquing the kind of soundness of something or the robustness of something but not necessarily the um inner kind of workings of it or details of how it's doing what it does
155	10:11	documentations ... .. um ... once again is a bit of an interpretation isn't it, something might be self-documenting but that's not usually the case
156	10:12	it's a bit of a problem when documentation quickly gets out of date and isn't maintained and I take your technology and change it to suit myself - do I safely and consistently document what I've changed
157	10:13	It annoys me this elitist view that people, a practitioner, should be able to look at a piece of technology and infer from it just by looking at its make-up and its form, exactly what its function and purpose is.
158	10:14	it's really common and surprisingly so in the open source world where you know people write some tricky bit of code and wont document it at all and write in a not necessarily deliberately obfuscated or difficult manner
159	10:15	it wouldn't hurt just to put a line before a half a page of code to say this is what this block of shit is going to do
160	10:16	there's a real that kind of arrogance is pretty commonly encountered and it's definitely an obstacle
161	10:17	if you spent a lifetime focused on one technology and you're an expert in it then it's not going to be a problem but as we're exposed to more and more greater numbers of technologies and you're expected to apply them, then that's definitely a problem then, you can't be expected to be an expert in all of them
162	10:18	so technical documentation's generally pretty crap
163	11:1	magazines that sell for the price of a small house at the dairy with some tacky CD on the front that offers you the latest software that puts virus on your machine and has nothing of any written substance really inside it apart from what the latest CPU fan for your machine is that you can buy
164	11:2	some manual that is waaay thick that's just unreadable in an enjoyable sense and so what you do is chick-peck it, you go on to find out about specific thing B so you flick through the index and you get there and it has so much small information that it's pretty much useless

165	11:3	I would probably use, professional categorisations so um I would start talking about user interface, business continuity, databases structured cabling, to describe the different sorts of technology, I think, because again, it's more specific
166	11:4	I'd call it documentation but I wouldn't refer to it as a written document, so documentation to me in that context of software has another meaning again, it's a word we use to describe in human language comments about technical instructions and its documentation in the same sense that the big thick manual might be
167	11:5	documentation is specific in its instruction and its purpose is to guide at a very micro level
168	12:1	My first thought was of, you know that web site Gizmodo, which just makes me cringe all the time the kind of salivating fanboys kind of writing vaguely pornographic descriptions of new technologies, most of which is sort of vapourware and would never eventuate, and it always comes across as quite sycophantic, and quite awful to be honest, so that was my first thought of written descriptions of technologies
169	12:2	the kind of 17,000 word blog post on the implications of a particular technological kind of phenomenon, tend to be very long-winded without a lot of substance, and I think it is because of these intangible qualities to the use of technology, perhaps based on complexity
170	12:3	I have seen good write-ups of technology, fantastic write-up of technology, but the pop-cultural one, the ones that you're exposed to very often
171	12:4	the question which is always missing for me is, why? It's all very good and well to have some device, but why, what does it actually do for me, how does it improve people's lives in any way, these questions are simply missing and subsumed simply into 'new technology, it's fascinating' ... 'new technology, this is good, because it's new' ... and I guess I think of that news cycle, that technological news cycle when I hear 'written description of technology'
172	12:5	the other end is the technical manual, which is the ultimate sort of dry unread put on a shelf somewhere
173	12:6	I don't think anybody has the patience ... for me, I'm always like 'Errr, I'll figure it out' it's a laziness for me, it really is, I could read this, no I won't, I'll just give it a go, it looks simple enough
174	12:7	good written description of technology. They tend to exist at the level of documentation for things like programmers, developers, developer documentation
175	12:8	projects which have created developer documentation to go along with their perhaps software library or hardware device

		which tend to be very good, there are some really awful ones as well which just border into technical manual, sorry user manual rather than technical manual
176	12:9	the Unix Man Pages are like the canonical example of just fantastically functional writing, in the sense that they give you exactly the information you need in a very condensed format and it's a standardised format, and, kind of give you the corner cases that are going to catch you out, and a description of the error messages you might have encountered
177	12:10	premised on the assumption you are using the technology and have a reason to consult the manual, so it's not starting from the basis of, you know, we're trying to sell you this product, which is kind of the fanboy writing, even though we're not trying to sell you it we're trying to make you excited about this product, we love it or hate it or whatever, we're trying to persuade you about something about this product, and it's not the technical manual where it seems to be 'well we'd better write some documentation and it had better weigh 100kg's or it's not enough documentation, people feel cheated if it's not a giant book, so I tend to follow stuff that follows from a task oriented approach, that kind of documentation tends to be very good
178	12:11	for in terms of writing about technology, if technology enables people to do things, then you essentially need the writings about technology also need to enable people to do things or enable people to use the technology to do things, so I guess I follow sort of a utilitarian motivated perspective on writing about technology





## Appendix 2.4: Raw Phrases & Terminology from Invivo Coding

Quotes from appendix 2.3 have been distilled by Invivo coding to succinct phrases and remarks and listed below. The alphabetical ordering usefully re-sorts dialogue liberating it from the sequence of the interview protocol in appendix 2.1.

- IV 1. a bit of documentation
- IV 2. a bunch of API calls
- IV 3. a component behaves
- IV 4. a database, a web browser, a web server
- IV 5. a detailed connection
- IV 6. a few discrete bits of code at each layer
- IV 7. a Flash object in a web page
- IV 8. a lifetime focused on one technology and you're an expert
- IV 9. a lot of commentary
- IV 10. a lot of the stuff, that kind of layering is, just seems to alien
- IV 11. a prescribed kind of, facility
- IV 12. a problem when documentation quickly gets out of date and isn't maintained
- IV 13. a raft of "technology"
- IV 14. a range of products
- IV 15. a real disconnect there
- IV 16. a reasonably complex suite of things
- IV 17. a sort of IDE
- IV 18. a sort of snapshot of technology
- IV 19. a specification for an encoding method or algorithm
- IV 20. a standard
- IV 21. a standardised format
- IV 22. a subset of the specification
- IV 23. a synergistic thing
- IV 24. a system
- IV 25. a tool set
- IV 26. a transport layer protocol or endpoint
- IV 27. a window into a piece of a broader specification
- IV 28. abstract things away into profiles
- IV 29. access points
- IV 30. access, communication through a channel
- IV 31. advanced constructs
- IV 32. advanced things
- IV 33. alien
- IV 34. all this hard work that somebody else has done
- IV 35. amazing technological processes
- IV 36. an enterprise flavour
- IV 37. an implementation of a technology
- IV 38. another point of connection
- IV 39. API that was talking to the Flash object
- IV 40. appear to be complicated or complex
- IV 41. appliance
- IV 42. appliances
- IV 43. application wrapped in a web page
- IV 44. applied as a collection
- IV 45. at least specific about
- IV 46. atomic is not the right word for it but you know it's like a building block of some thing
- IV 47. automatically happens in the background
- IV 48. based on complexity
- IV 49. based on the standard or the technical spec
- IV 50. basically its access to a channel
- IV 51. be more specific
- IV 52. be pretty specific
- IV 53. become these wonderful nouns
- IV 54. better and more optimised

- IV 55. beyond what simple inspection could reveal
- IV 56. big thick manual
- IV 57. binding
- IV 58. binding in runtimes and things
- IV 59. bought together into a monolithic entity
- IV 60. brand name
- IV 61. breadth and scope of it
- IV 62. building block
- IV 63. business continuity
- IV 64. buzzwords
- IV 65. can be run independent of it
- IV 66. can invoke a service
- IV 67. chick-peck it,
- IV 68. cloud of connections
- IV 69. combined for some purpose
- IV 70. comment on how it might be implemented
- IV 71. communications now the main thing
- IV 72. complexity
- IV 73. complexity
- IV 74. component
- IV 75. composed of many different parts
- IV 76. connection thought is largely around the user accessing this pool through the medium of a device
- IV 77. constraints
- IV 78. convoluted approach
- IV 79. customer perception
- IV 80. databases
- IV 81. definitely an obstacle
- IV 82. describes intimately
- IV 83. design patterns and things
- IV 84. design patterns are overlaid as concepts
- IV 85. developer documentation
- IV 86. device
- IV 87. different sorts of technology
- IV 88. discrete things
- IV 89. distributable
- IV 90. distributed systems
- IV 91. documentation to me in that context of software has another meaning again
- IV 92. don't seem to think that there's any need to explain what it's doing
- IV 93. don't have to write the whole system
- IV 94. downloaded this thing
- IV 95. embracing something
- IV 96. enable automation
- IV 97. enabling communications technologies
- IV 98. enabling them
- IV 99. encapsulate
- IV 100. established
- IV 101. everything else is handled by
- IV 102. everything else is just configuration
- IV 103. evolves with us
- IV 104. exposed in so many different places
- IV 105. exposes certain things natively
- IV 106. Facebook conversation chunks
- IV 107. facilitating
- IV 108. find out about specific thing B
- IV 109. focusing on and not being distracted by things that are not relevant
- IV 110. for certain users or uses
- IV 111. forum information
- IV 112. framework running
- IV 113. function and purpose
- IV 114. functional aspects
- IV 115. get specific really quickly

IV 116. getting libraries in place  
IV 117. gotchas  
IV 118. half a page of code  
IV 119. hardware device  
IV 120. here's the workaround  
IV 121. hidden  
IV 122. hide so much complexity  
IV 123. high-tech  
IV 124. horrendously complex  
IV 125. how Firefox handles HTML 5  
IV 126. how stuff works  
IV 127. HTML being a subset of SGML, that's a kind of a profile  
IV 128. huge amount of complexity  
IV 129. human creations that automate  
IV 130. human language comments  
IV 131. I approach that as a programmer because that was sort of my world for a long time  
IV 132. I write the glue code that kind of puts them together  
IV 133. if everything goes smoothly  
IV 134. if they probe, open the conversation up  
IV 135. impact on the performance of the thing  
IV 136. implement  
IV 137. implications of a particular technological kind of phenomenon  
IV 138. in terms of access  
IV 139. including them at each point  
IV 140. information and sources  
IV 141. instruction manuals  
IV 142. intangible qualities  
IV 143. interface  
IV 144. interpreting  
IV 145. irrelevant detail  
IV 146. is a genuine problem  
IV 147. isolated points of responsibility  
IV 148. it should be simple but  
IV 149. it's never ending  
IV 150. it's pretty overwhelming  
IV 151. it's that component based approach  
IV 152. it'd be hard work and you may not be able to implement them yourselves  
IV 153. its construction  
IV 154. just configuration, it's not coding  
IV 155. just grab the library  
IV 156. layering  
IV 157. layers  
IV 158. layers of premises  
IV 159. library  
IV 160. licensing  
IV 161. loading support libraries  
IV 162. looking through the code  
IV 163. low level stuff  
IV 164. magazines that sell for the price of a small house  
IV 165. magic  
IV 166. magic  
IV 167. magic'  
IV 168. magical  
IV 169. magical  
IV 170. magical'  
IV 171. maintenance  
IV 172. make tasks easier  
IV 173. make up a protocol that went over TCP/IP  
IV 174. make work easier  
IV 175. malfunctioning  
IV 176. man-made automatable  
IV 177. marketing blurb

IV 178. maybe way too much involved  
IV 179. mechanism to do something  
IV 180. more about the experience  
IV 181. more specific  
IV 182. more specific  
IV 183. more than we imagined  
IV 184. motivating them  
IV 185. multidisciplinary things  
IV 186. need to identify  
IV 187. new stuff that solves problems  
IV 188. new technology, it's fascinating  
IV 189. new technology, this is good, because it's new  
IV 190. newish  
IV 191. none of these things he was using himself  
IV 192. non-technical  
IV 193. non-technical  
IV 194. not a web service that's just network service  
IV 195. not necessarily deliberately obfuscated or difficult manner  
IV 196. not their responsibility  
IV 197. novelty  
IV 198. objects, classes, its um, remote procedure invocation, and capabilities based security  
IV 199. obstacles along the way  
IV 200. one web server may talk to another  
IV 201. only documentation is in the code  
IV 202. only writing one element  
IV 203. open using it to build other technologies  
IV 204. originally it was server-centric  
IV 205. particularly specific  
IV 206. particularly things that enable  
IV 207. particularly where you don't understand what the problem is either  
IV 208. people entering stuff in  
IV 209. people will write about a standard  
IV 210. perhaps speculating  
IV 211. pick up a spec and have a crack at it  
IV 212. professional categorisations  
IV 213. profiles of technology  
IV 214. programmer is an umbrella term  
IV 215. protocols that govern  
IV 216. pulling together 15 different bits, plugging them together  
IV 217. pulling together disparate elements that kind of hide the complexity  
IV 218. quite a collection of different tools  
IV 219. quite complicated  
IV 220. quite large atomic building blocks  
IV 221. quite ubiquitous  
IV 222. rather than the technology itself  
IV 223. really heavy technical specifications  
IV 224. refined  
IV 225. relevant in certain circumstances  
IV 226. resourcing  
IV 227. retrieve some additional information  
IV 228. RFC  
IV 229. runtimes  
IV 230. salivating fanboys  
IV 231. see how a sample call would work  
IV 232. self-contained black box  
IV 233. selling the dream  
IV 234. semi-technical people  
IV 235. separation of concerns for example  
IV 236. service listing  
IV 237. sketch up a bit of an architectural kind of diagram  
IV 238. so complex

IV 239. so much small information that it's pretty much useless  
IV 240. SOAP, REST and Web Services, and Service Oriented Architectures  
IV 241. software architecture  
IV 242. software comments  
IV 243. software libraries  
IV 244. software library  
IV 245. software or real or mechanical or range  
IV 246. some ... python expert and you look at a block of python code, you're not going to have any trouble interpreting what it's doing  
IV 247. some complexity  
IV 248. some manual that is waaay thick  
IV 249. some piece of code  
IV 250. some pretty broad collections of things  
IV 251. some sort tool that has a known, relatively known capability that you can depend on  
IV 252. some specific outcome  
IV 253. some tricky bit of code  
IV 254. something might be self-documenting but that's not usually the case  
IV 255. something proprietary  
IV 256. something technical  
IV 257. sort of complex  
IV 258. specific technology  
IV 259. specifications  
IV 260. stagnated, no documentation  
IV 261. structured cabling  
IV 262. stuff  
IV 263. talking  
IV 264. task oriented approach  
IV 265. technical documentation  
IV 266. technical instructions  
IV 267. technical manual  
IV 268. technical specs  
IV 269. technological news cycle  
IV 270. technologists  
IV 271. terminology of software engineers  
IV 272. that complexity  
IV 273. the actual technical specifications themselves  
IV 274. the deliverable  
IV 275. the domain of programmers  
IV 276. the end result was this runtime that talks to the application  
IV 277. the functional thing is  
IV 278. the HTML 5 spec  
IV 279. the interaction between each one of those layers  
IV 280. the mechanics of how the code results in the run of circumstance or an occurrence  
IV 281. the piece of the puzzle  
IV 282. the Proxy design pattern to remotely invoke this bit of the system  
IV 283. the specific point  
IV 284. the specific thing  
IV 285. the technicalities of how  
IV 286. the way two different technologies are interacting or interchanging information, behaviour or state or ...something  
IV 287. the world is becoming less coder and more application  
IV 288. their relationships to each other  
IV 289. there was this particular technology  
IV 290. there's all these abstractions  
IV 291. they may not be doing it consciously  
IV 292. they perhaps get conflated a little bit  
IV 293. things hang of the channel  
IV 294. things like refresh rates or resolutions or dimensions  
IV 295. things that didn't behave the way that I thought they would have  
IV 296. this additional Flash library supported probing a bit deeper  
IV 297. this block of shit  
IV 298. those mash-up things

- IV 299. Thousands of pages of dry stuff,
- IV 300. to sort of perform a task which itself can't perform
- IV 301. tomes
- IV 302. too much detail
- IV 303. totally ubiquitous
- IV 304. trade-offs of a more complex system
- IV 305. tried every patch that's around
- IV 306. trying to describe the bigger picture
- IV 307. trying to figure out how the thing works
- IV 308. trying to relate things to how he was doing testing
- IV 309. typically software
- IV 310. typing, compiling, building, deploying, running, witnessing the result
- IV 311. ubiquitous
- IV 312. ubiquitous technology
- IV 313. ubiquity
- IV 314. ubiquity
- IV 315. unreadable in an enjoyable sense
- IV 316. use to um perform certain functions that you know the technology may be applicable to
- IV 317. use words like collect, or combine rather than engineer or render
- IV 318. user interface
- IV 319. user manual
- IV 320. user manuals
- IV 321. using a JS API to talk
- IV 322. using it incorrectly
- IV 323. using it, just moving, using it, and moving on, doing what you need to do
- IV 324. vapourware
- IV 325. vendor specifications for how they implemented things
- IV 326. very complex
- IV 327. very simple
- IV 328. very very huge degree of complexity behind them
- IV 329. view of the technology
- IV 330. we can't do
- IV 331. we just don't enjoy doing
- IV 332. web service
- IV 333. Web to be a web service
- IV 334. well prescribed and specified
- IV 335. what the expectation is
- IV 336. which are used to hide that detail in a sense of combining disparate technologies
- IV 337. which don't describe the product in any way but describe it intimately
- IV 338. without having to have complete comprehension of it
- IV 339. work in harmony
- IV 340. workings of it
- IV 341. would take us a long time to do
- IV 342. write something that listened to a particular port
- IV 343. you can get it via your
- IV 344. you know you don't completely understand it
- IV 345. you know, this that and the other in order to bring together the whole package
- IV 346. you see the end result
- IV 347. you use it and you never really have to look inside it
- IV 348. you'd look into black box where possible
- IV 349. your natural reaction is to push back against complexity
- IV 350. you're always connected somehow

## Appendix 2.5: Emic Categories from Secondary Coding

The tables below (tables 3 to 9) list the contributing phrases that suggested the following emic categories, as emerged during secondary coding of the In vivo phrases from appendix 2.4:

- Advanced constructs
- Complex, *or*
- Complicated
- Building block
- Enabling
- Newish
- Ubiquitous

Table 3 - Advanced Constructs

Atlas.ti Ref.	Phrase or Term
q1:1	constructs
q1:2	advanced
q1:7	refined
q1:10	advanced things
q1:11	advanced constructs
q1:14	multidisciplinary
q1:26	build other technologies
q1:29	self-contained black box
q1:33	synergistic thing
q1:36	optimised
q1:40	pretty broad collections of things
q1:43	applied as a collection
q1:50	man-made
q1:52	we can't do
q1:55	system
q1:56	technical
q1:57	software
q1:60	products
q1:61	raft of "technology"
q1:64	human creations that automate
q1:71	beyond what simple inspection could reveal
q1:75	conflated a little bit
q1:77	high-tech
q1:79	appliances
q1:80	amazing technological processes
q1:85	how stuff works
q1:91	construction
q1:96	huge degree of complexity
q1:103	web service
q1:105	network service
q1:108	happens in the background
q1:112	combined for some purpose
q1:113	interacting
q1:114	interchanging information
q1:115	behaviour or state
q1:116	deliverable
q1:118	piece of code
q1:119	particular technology
q1:120	piece of the puzzle



q1:121 complex suite of things  
q1:122 application wrapped in a web page  
q1:123 using a JS API to talk  
q1:124 talking to the Flash object  
q1:125 runtimes  
q1:126 library  
q1:129 component  
q1:130 interface  
q1:132 run independent  
q1:133 sort of IDE  
q1:134 runtime that talks to the application  
q1:135 abstractions  
q1:136 exposes certain things natively  
q1:138 interaction between each one of those layers  
q1:140 code results in the run of circumstance  
q1:141 real disconnect  
q1:142 how the thing works  
q1:144 framework running  
q1:147 architectural  
q1:148 bunch of API calls  
q1:149 discrete bits of code  
q1:150 code at each layer  
q1:154 typing, compiling, building  
q1:155 deploying, running, witnessing the result  
q1:166 pretty overwhelming  
q1:167 the stuff, that kind of layering  
q1:168 just seems to alien  
q1:171 should be simple but  
q1:173 more complex system  
q1:174 isolated points of responsibility  
q1:175 don't have to write the whole system  
q1:177 just configuration  
q1:178 getting libraries in place  
q1:179 configuration, it's not coding  
q1:180 binding in runtimes and things  
q1:181 loading support libraries  
q1:183 too much detail  
q1:189 without having to have complete  
comprehension  
q1:191 transport layer protocol  
q1:192 a spec  
q1:193 listened to a particular port  
q1:194 protocol  
q1:195 went over TCP/IP  
q1:196 cloud of connections  
q1:198 device  
q1:199 detailed connection  
q1:202 a database  
q1:203 a web browser  
q1:204 a web server  
q1:205 bring together the whole package  
q1:207 encapsulate  
q1:209 SOAP  
q1:210 REST  
q1:211 Web Services  
q1:212 Service Oriented Architectures  
q1:214 web server may talk to another  
q1:218 composed of many different parts  
q1:219 enterprise flavour  
q1:220 mash-up things  
q1:221 monolithic entity  
q1:222 bought together

q1:223 software architecture  
 q1:226 remote procedure invocation  
 q1:229 combining disparate technologies  
 q1:230 separation of concerns  
 q1:231 design patterns  
 q1:232 remotely invoke  
 q1:234 distributed systems  
 q1:235 design patterns are overlaid  
 q1:236 pulling together 15 different bits  
 q1:237 plugging them together  
 q1:238 disparate elements that kind of hide the complexity  
 q1:239 pulling together disparate elements  
 q1:242 use it and you never really have to look inside  
 q1:243 component based approach  
 q1:244 the glue code that kind of puts them together  
 q1:245 tomes  
 q1:248 describe it intimately  
 q1:250 technical specs  
 q1:251 quite large atomic building blocks  
 q1:252 low level stuff  
 q1:253 specifications  
 q1:254 an implementation of a technology  
 q1:256 HTML 5 spec  
 q1:257 specification for an encoding method  
 q1:258 algorithm  
 q1:259 profiles of technology  
 q1:260 snapshot of technology  
 q1:261 really heavy technical specifications  
 q1:262 subset of the specification  
 q1:263 HTML being a subset of SGML  
 q1:264 window into a piece of a broader specification  
 q1:265 vendor specifications  
 q1:269 some tricky bit of code  
 q1:270 not necessarily deliberately obfuscated  
 q1:271 block of shit  
 q1:272 half a page of code  
 q1:274 block of python code  
 q1:275 manual that is waaay thick  
 q1:277 specific thing B  
 q1:278 so much small information  
 q1:279 user interface  
 q1:281 databases  
 q1:282 structured cabling  
 q1:283 Facebook conversation chunks  
 q1:284 forum information  
 q1:285 human language comments  
 q1:287 big thick manual  
 q1:289 vapourware  
 q1:290 software library  
 q1:291 hardware device  
 q1:292 developer documentation  
 q1:293 user manual  
 q1:294 technical manual

**Table 4 - Complex**

Atlas.ti Ref.	Phrase or Term
q1:13	complex
q1:28	black box

q1:29 self-contained black box  
q1:32 complex  
q1:33 synergistic thing  
q1:34 evolves  
q1:35 more than we imagined  
q1:40 pretty broad collections of things  
q1:42 work in harmony  
q1:43 applied as a collection  
q1:61 raft of "technology"  
q1:69 sort of complex  
q1:71 beyond what simple inspection could reveal  
q1:81 hidden  
q1:82 huge amount of complexity  
q1:84 that complexity  
q1:89 layers  
q1:90 layers of premises  
q1:93 magic  
q1:94 magical  
q1:95 complexity  
q1:96 huge degree of complexity  
q1:100 horrendously complex  
q1:115 behaviour or state  
q1:121 complex suite of things  
q1:123 using a JS API to talk  
q1:125 runtimes  
q1:131 distributable  
q1:132 run independent  
q1:134 runtime that talks to the application  
q1:135 abstractions  
q1:136 exposes certain things natively  
q1:138 interaction between each one of those layers  
q1:140 code results in the run of circumstance  
q1:148 bunch of API calls  
q1:150 code at each layer  
q1:155 deploying, running, witnessing the result  
q1:162 complexity  
q1:166 pretty overwhelming  
q1:167 the stuff, that kind of layering  
q1:168 just seems to alien  
q1:169 so complex  
q1:170 push back against complexity  
q1:171 should be simple but  
q1:173 more complex system  
q1:175 don't have to write the whole system  
q1:183 too much detail  
q1:184 it's never ending  
q1:186 don't completely understand it  
q1:189 without having to have complete  
comprehension  
q1:196 cloud of connections  
q1:207 encapsulate  
q1:208 hide so much complexity  
q1:214 web server may talk to another  
q1:228 used to hide that detail  
q1:229 combining disparate technologies  
q1:230 separation of concerns  
q1:234 distributed systems  
q1:235 design patterns are overlaid  
q1:238 disparate elements that kind of hide the  
complexity  
q1:251 quite large atomic building blocks  
q1:269 some tricky bit of code

**Table 5 - Complication**

Atlas.ti Ref.	Phrase or Term
q1:12	complicated
q1:15	prescribed
q1:24	prescribed
q1:25	specified
q1:27	self-contained
q1:29	self-contained black box
q1:36	optimised
q1:41	pretty specific
q1:44	more specific
q1:45	at least specific about
q1:46	specific technology
q1:47	specific outcome
q1:48	discrete things
q1:49	automatable
q1:51	mechanism
q1:58	mechanical
q1:59	more specific
q1:62	particularly specific
q1:63	get specific really quickly
q1:70	workings of it
q1:71	beyond what simple inspection could reveal
q1:76	quite complicated
q1:85	how stuff works
q1:113	interacting
q1:120	piece of the puzzle
q1:126	library
q1:129	component
q1:137	collection of different tools
q1:139	technicalities
q1:144	framework running
q1:147	architectural
q1:149	discrete bits of code
q1:154	typing, compiling, building
q1:156	gotchas
q1:164	convoluted approach
q1:165	look into black box
q1:171	should be simple but
q1:174	isolated points of responsibility
q1:175	don't have to write the whole system
q1:176	only writing one element
q1:182	a component behaves
q1:183	too much detail
q1:184	it's never ending
q1:186	don't completely understand it
q1:189	without having to have complete comprehension
q1:193	listened to a particular port
q1:199	detailed connection
q1:201	binding
q1:205	bring together the whole package
q1:207	encapsulate
q1:218	composed of many different parts
q1:229	combining disparate technologies
q1:233	this bit of the system
q1:236	pulling together 15 different bits
q1:237	plugging them together
q1:239	pulling together disparate elements
q1:242	use it and you never really have to look

	inside
q1:243	component based approach
q1:244	the glue code that kind of puts them together
q1:251	quite large atomic building blocks
q1:252	low level stuff
q1:269	some tricky bit of code
q1:270	not necessarily deliberately obfuscated
q1:271	block of shit
q1:277	specific thing B
q1:278	so much small information

**Table 6 - Building Block**

Atlas.ti Ref.	Phrase or Term
q1:5	building block
q1:8	new stuff
q1:18	tool
q1:22	functions
q1:30	tool set
q1:31	simple
q1:39	proprietary
q1:41	pretty specific
q1:48	discrete things
q1:51	mechanism
q1:68	novelty
q1:79	appliances
q1:81	hidden
q1:86	the specific thing
q1:99	quite ubiquitous
q1:103	web service
q1:105	network service
q1:110	every patch
q1:119	particular technology
q1:137	collection of different tools
q1:139	technicalities
q1:171	should be simple but
q1:188	doing what you need to do
q1:190	endpoint
q1:191	transport layer protocol
q1:193	listened to a particular port
q1:198	device
q1:224	objects
q1:225	classes
q1:255	how Firefox handles HTML 5

**Table 7 – Enabling**

Atlas.ti Ref.	Phrase or Term
q1:9	solves problems
q1:16	enabling
q1:17	facility
q1:19	known capability
q1:20	depend on

q1:21 perform  
q1:23 applicable  
q1:36 optimised  
q1:42 work in harmony  
q1:47 specific outcome  
q1:49 automatable  
q1:51 mechanism  
q1:52 we can't do  
q1:53 take us a long time  
q1:54 we just don't enjoy doing  
q1:64 human creations that automate  
q1:65 make work easier  
q1:66 make tasks easier  
q1:73 things that enable  
q1:74 enable automation  
q1:78 enabling communications  
q1:83 see the end result  
q1:87 malfunctioning  
q1:88 everything goes smoothly  
q1:92 functional  
q1:97 motivating them  
q1:98 enabling them  
q1:101 communications  
q1:102 access to a channel  
q1:106 using it incorrectly  
q1:107 automatically happens  
q1:109 is a genuine problem  
q1:111 the workaround  
q1:117 experience  
q1:127 facilitating  
q1:128 talking  
q1:130 interface  
q1:132 run independent  
q1:133 sort of IDE  
q1:137 collection of different tools  
q1:141 real disconnect  
q1:143 not their responsibility  
q1:145 obstacles  
q1:151 a sample call  
q1:152 expectation  
q1:153 functional thing  
q1:156 gotchas  
q1:157 didn't behave  
q1:158 licensing  
q1:159 performance of the thing  
q1:160 customer perception  
q1:163 resourcing  
q1:170 push back against complexity  
q1:172 trade-offs  
q1:176 only writing one element  
q1:177 just configuration  
q1:178 getting libraries in place  
q1:179 configuration, it's not coding  
q1:180 binding in runtimes and things  
q1:181 loading support libraries  
q1:182 a component behaves  
q1:185 embracing something  
q1:187 using it, and moving on  
q1:194 protocol  
q1:197 access points  
q1:206 constraints  
q1:213 protocols that govern

q1:215	retrieve some additional information
q1:216	invoke a service
q1:217	perform a task which it itself can't perform
q1:226	remote procedure invocation
q1:227	capabilities based security
q1:240	grab the library
q1:241	may not be able to implement
q1:242	use it and you never really have to look inside
q1:247	don't describe the product
q1:266	isn't maintained
q1:267	documentation quickly gets out of date
q1:268	function and purpose
q1:273	definitely an obstacle
q1:276	chick-peck it
q1:279	user interface
q1:280	business continuity
q1:283	Facebook conversation chunks
q1:285	human language comments
q1:286	technical instructions
q1:288	software comments
q1:289	vapourware
q1:295	task oriented approach

**Table 8 – Newish**

Atlas.ti Ref.	Phrase or Term
q1:3	newish
q1:34	evolves
q1:36	optimised
q1:68	novelty
q1:146	stagnated
q1:161	maintenance
q1:185	embracing something
q1:249	selling the dream
q1:267	documentation quickly gets out of date

**Table 9 - Ubiquitous**

Atlas.ti Ref.	Phrase or Term
q1:4	established
q1:6	ubiquitous
q1:37	standard
q1:38	brand name
q1:67	totally ubiquitous
q1:72	ubiquity
q1:104	always connected
q1:131	distributable
q1:184	it's never ending
q1:192	a spec
q1:198	device
q1:200	device
q1:246	RFC

## Appendix 2.6: Analytical Memos

Coding has been a multi-stage process revealed in appendices 2.3-2.6. This appendix reviews the stages of the coding process and then explains the transformation from coded material to analyses and interpretations that are the evidential basis used in the thesis.

### *Stages of the Coding Process*

The first stage was the isolating of a set of core quotations by initial coding (appendix 2.3). Much material was excluded during that stage of coding, such as inconsistent 'ranging' as the right language to express concepts and successive attempts were made to connect the terminology of a very particular dialect. Some examples of those type of statements are still visible in the initial quotations (e.g. "*that appear to be, I was going to say*" or "*could be a, might be um*"). The initial coding isolated key passages of interview dialogue that reflected meaningful statements, an analytical approach that has helped isolate professional 'observations' relevant to this study.

The process continued with a second stage of coding using the Invivo technique. This stage occurred in two steps that firstly isolated phrases and terminology (appendix 2.4) from the core quotations produced during initial coding and secondly further compounded those phrases into a reduced set of codes that could potentially operate as emic categories (appendix 2.5). In other words, the phrases selected during the first step of Invivo coding were further coded to condense statements to the briefest of phrases: a remark.

It was also during the second step of Invivo coding that further coding techniques were introduced. The second step applied Simultaneous and Theoretical coding techniques. The Simultaneous technique allowed for the multiple applications of different codes, a technique befitting the textual material that was generated by those 'ranging' discussions with their potentially multiple meanings. The Theoretical technique was specific to the two codes of 'complication' and 'complex', an ambiguity introduced by the questioning synonymous use by an informant. There is a difference to be established between those terms (see section 3.3) and that theoretical difference has in turn informed secondary coding against those emic categories.

The explanation of the coding process has so far focussed on selection of quotes and



techniques for labelling those with codes. Interpretations were forming throughout those actions and the next part will reveal their formation as analytical memos.

*Analytical Memo 1: The Human Construction of Technology*

The Internet technologies examined by this project are understood as a substantial human construction. The phrase 'substantial human construction' is one I use to summarise the scale and synthetic nature of the constructions these informants have some role in constructing. The informants use their own vocabulary to explain in a variety of ways their perspective on types of technology, like the Internet technologies that enable the use-case of photo collections on an Augmented Reality layer, and how those technologies connect and describe. They describe those technologies as:

... some advanced constructs so things that people make, to do something-to suit some role (quote 1)

... is most often used with advanced things that appear to be, I was going to say technological but, appear to be complicated or complex (quote 9)

... essentially human creations that automate or make work easier or make tasks easier (quote 44)

... all these things that, despite all these things being quite ubiquitous, have this very very huge degree of complexity behind them, kind of motivating them or enabling them (quote 85)

... these wonderful nouns that actually hide so much complexity, so you can say SOAP, REST and Web Services, and Service Oriented Architectures (quote 124)

Analytical proposition 1: the human construction of Technology is an advanced construct that is complicated or complex.

*Analytical Memo 2: Complicated or Complex?*

The terms 'complicated' and 'complex' were used interchangeably by one informant (quote 9). Other informants also indirectly represented technology as complicated and complex describing it as:

... a synergistic thing so that we're able to do more than we could imagine or more than we imagined we would (quote 17)

... a collection of individual technologies that work in harmony or together or are applied as a collection rather than being a new technology (quote 22)

Or reminding that the complication or complexity exists but is hidden because:

... a lot of the things we would consider technology are, you know, hidden, in a sense that the wires are in the walls and the switches are in the network cabinet and all the amazing technological processes that kind of actually make Farmville run (quote 59)

Which is a perspective on technology that suggests much of technology is to provide shelter to others from itself so that your perception is only that:

... you see the end result of all this huge amount of complexity (quote 61)

Analytical proposition 2: whether these advanced constructs are complicated or complex and what the distinction is between complicated and complexity warrants a closer examination of those hidden things.



## **Appendix 2.7: Secondary Simultaneous Coding of Complication or Complexity**

The analytical propositions from appendix 2.6 are inflected back into the raw quotations by secondary simultaneous coding. The technique of simultaneous coding is used to explore within the text how in vivo statements correspond with the narrower theoretical elaboration of 'complication' and 'complexity' by complexity theorists Cilliers, Capra, Urry, Nowotny and the sociological perspectives of Bennett and Latour. This theoretical elaboration is discussed in section 3.3 of the thesis.

What follows in Table 10 is the coding of quotations against those narrower sub-categories. An approximate measure of complication or complexity is calculated to suggest how vocabulary and phrases could be interpreted as being mostly of one mode or another.

Figure 33 also demonstrates the distinction between complicated or complex with a network diagram. The numeric notation on this diagram is a reference to the quotations. Quotations that have balanced associations with complicated or complexity are positioned in the centre. The next level has associations with both but one mode of complicated or complexity is predominant. The third level identifies quotes that were coded exclusively as complicated or complexity.

At this juncture, attention returns focus to the thesis proper. The activity of qualitative coding is ceased having established a useful difference via complexity theory between complication or complexity. This difference serves as a dyadic analyses and gains significance as a difference that matters when the emic categories of informants are further elaborated with the flattening vocabulary of Bennett and Latour. These concerns and interests are pursued in chapters 3 to 5 of the thesis.



Table 10 - Simultaneous Coded Quotations

'Complicate' (word stem)	Complicated							'Complex' (word stem)	Complexity							Count			%		Ref.	Quote	Memo/Notes				
	Attributes	Actants	Closed system	Collective	Dependencies	Describable	Reductive		Task oriented	Conatus	Confederation	Contingent	Irreducible	Metabolic	Open system	Protoactants	Vitality	Complication	Complexity	Total				Code Density	Complication	Complexity	
X	X	X					X	X											2	0	2	11%	100%	0%	q1:1	I guess it's some advanced constructs so things that people make, to do something-to suit some role	
			X					X					X		X				1	3	4	22%	25%	75%	q1:12	so in a vehicle there are many 'technologies' but they're multidisciplinary, so they're not just computing, there's electrical, refrigeration technologies, there won't just be the same thing, the same basic ideas there	
				X			X			X				X					1	2	3	17%	33%	67%	q1:2	it's probably new, the idea of technology is that it is newish because after a while it stops being technology	
		X	X			X													2	0	2	11%	100%	0%	q1:23	if it becomes so ubiquitous it's part of your life it's no longer technology	
																			3	0	3	17%	100%	0%	q1:24	probably only thing that I'd say is the difference between technology and technologies or might be is that technologies might be derivative	
	X								X	X									1	2	3	17%	33%	67%	q1:6	so there's technology there, but people don't perceive it as technology	
		X					X	X								X			1	2	3	17%	33%	67%	q1:7	the idea of technology, it's the new stuff that solves problems	
X								X			X				X				2	3	5	28%	40%	60%	q1:9	technology is most often used with advanced things that appear to be, I was going to say technological but, appear to be complicated or complex	
		X		X			X		X				X	X					3	3	6	33%	50%	50%	q2:11	rather than a collection being a new technology, there's a collection of technologies I suppose where their purposes maybe aren't necessarily always aligned but you kind of lash them together for some other outcome that you're aiming for	Is the lashing them together a form of inter-operating with technologies to make them inter-operate between technologies, so the collection becomes some alternative 'advanced construct' - a confederation? So are devices an actant and technologies protoactants, a reductive servant to device - used by devices?
														X					0	1	1	6%	0%	100%	q2:12	Personal life, it'd be more specific to maybe devices that use technologies or appliances or something	
							X							X					0	2	2	11%	0%	100%	q2:3	doesn't have to be sophisticated, could be very simple or very complex	
		X					X												2	0	2	11%	100%	0%	q2:40	a prescribed kind of, facility	
		X			X		X												3	0	3	17%	100%	0%	q2:41	some sort tool that has a known, relatively known capability that you can depend on	
		X			X	X	X												4	0	4	22%	100%	0%	q2:42	perform certain functions that you know the technology may be applicable to might be kind of well prescribed and specified	
									X		X		X		X				0	4	4	22%	0%	100%	q2:43	could be something more open using it to build other technologies	
		X									X								1	1	2	11%	50%	50%	q2:44	might be um self-contained black box or a tool set	

	X						X	X		X		1	3	4	22%	25%	75%	q2:45	technology is something that we've had since we were cave man and it evolves with us, I guess, as our needs and expectations evolve	
							X	X				0	4	4	22%	0%	100%	q2:46	sometimes it's a synergistic thing so that we're able to do more than we could imagine or more than we imagined we would with the tool or technology	
X										X	X	1	2	3	17%	33%	67%	q2:47	hopefully it leads on to better and better and more optimised technologies	
	X	X	X	X	X							5	0	5	28%	100%	0%	q2:48	usually I would speak in more specific terms about a, a standard or brand name or something proprietary	
	X										X	3	1	4	22%	75%	25%	q2:49	probably talking more specifically about 'a' single technology in terms of its identity	
	X		X	X				X			X	3	2	5	28%	60%	40%	q2:50	it's definitely some pretty broad collections of things that you might describe as a single technology	Protoactant is the 'things' and Actant is the 'single technology.'
X			X	X	X	X					X	5	1	6	33%	83%	17%	q2:51	you need to be pretty careful about understanding what all those things mean as a collection, it's pretty clear, I think when you see or hear somebody talking about something where they're not, apparently not, got a full complement of um understanding	
X						X					X	2	2	4	22%	50%	50%	q2:52	you've got to be pretty specific or at least specific about what you are claiming to know	
			X					X			X	1	2	3	17%	33%	67%	q2:53	a collection of individual technologies that work in harmony or together or are applied as a collection rather than being a new technology	Is this harmony amid collections of technologies otherwise known as interoperability - something of a fluid vitality.
	X				X	X	X					4	0	4	22%	100%	0%	q2:54	it'd be more specific to maybe devices that use technologies or appliances or something	
	X	X			X							3	0	3	17%	100%	0%	q2:56	I think I would probably usually thinking about a specific technology	
			X					X			X	1	2	3	17%	33%	67%	q2:57	apart from that example of applying a bunch of them for some specific outcome	
		X			X						X	2	1	3	17%	67%	33%	q2:58	I'd usually be thinking of them as discrete things, rather than a collection	
								X		X		0	2	2	11%	0%	100%	q2:59	a collection of disparate technologies pretty oddball um concept	
		X										1	0	1	6%	100%	0%	q2:7	I tend to err on the side of caution, and be not, not be very specific about it if I'm not completely familiar with it	
		X		X		X						3	0	3	17%	100%	0%	q3:32	I think of something mechanical	
	X		X	X			X		X		X	3	3	6	33%	50%	50%	q3:33	maybe half a second later ... I start thinking okay, it's up software running on machines because that's my professional environment	Similar to previous about things on devices. Software running on another actant, a dependency, a metabolic process of running.
		X			X	X						3	0	3	17%	100%	0%	q3:34	it's a man-made automatable, or mechanism	
							X					1	1	2	11%	50%	50%	q3:35	to do something either we can't do or would take us a long time to do or we just don't enjoy doing it	A distorted Conatus I call an AntiConatus because it is an anti human volition. Again, servitude, to do what we don't want to do
	X							X				1	1	2	11%	50%	50%	q3:36	technology is something broader, the majority of which I don't really understand	



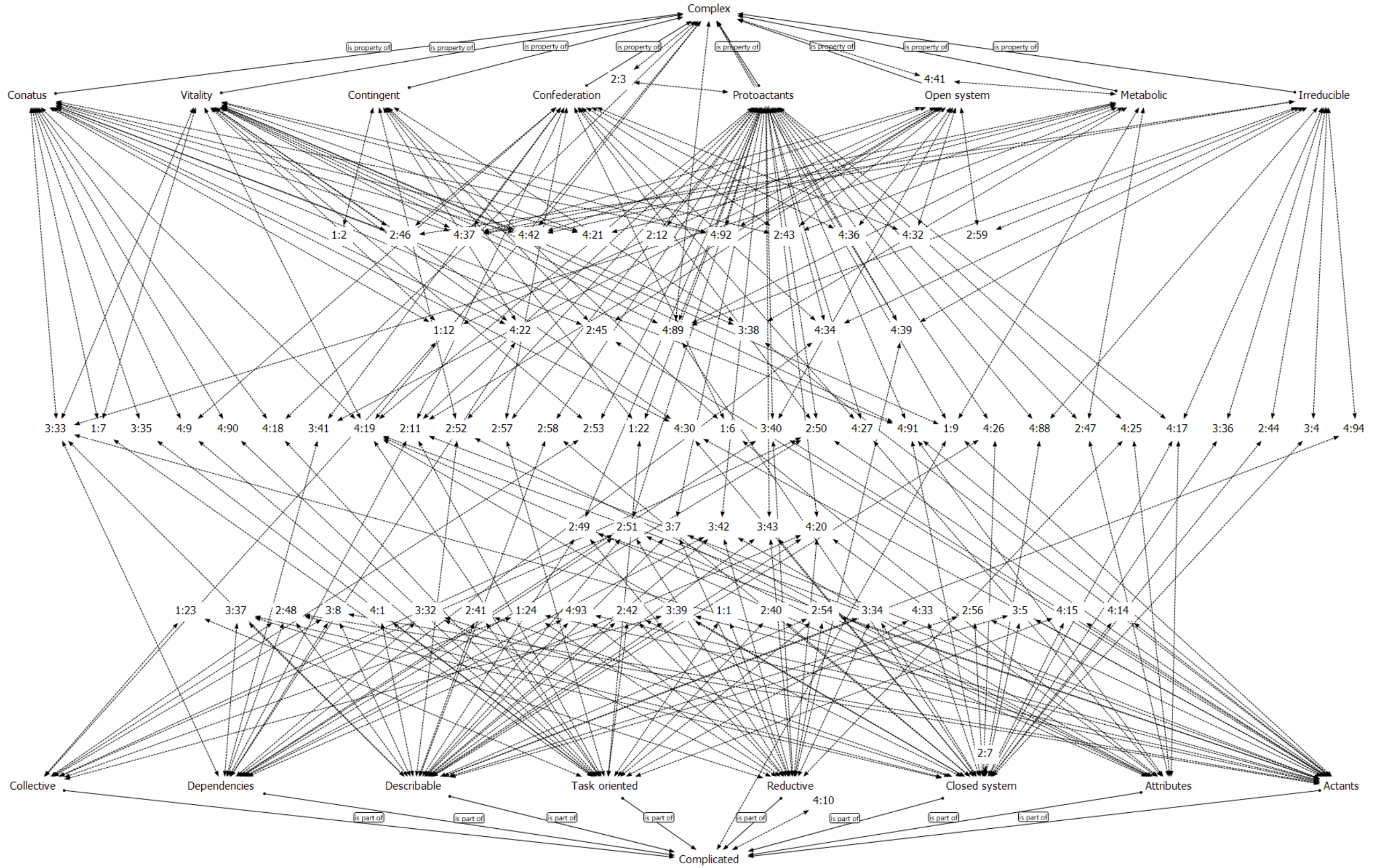




							X		X				X					1	3	4	22%	<div style="width: 25%;"></div>	<div style="width: 75%;"></div>	q4:39	when I encounter that complexity I certainly go 'wow that's kind of magical' even though I understand it down to the wires, I still go 'that's pretty magic'	Conflict of reductive and irreducible because understands it down to the wires is reductive but the irreducible trace is because of reference to magic. Possibly trace of a magical realist moment, those conflicted realities.
									X				X	X				0	3	3	17%	<div style="width: 0%;"></div>	<div style="width: 100%;"></div>	q4:41	that's bizarre in a sense that these things are so horrendously complex but then they kind of, the feed-on effects are so ubiquitous	horrendously is a suggestion of large scale, so an open system. feed-on-effects is metabolic.
									X	X			X	X			X	0	5	5	28%	<div style="width: 0%;"></div>	<div style="width: 100%;"></div>	q4:42	the technologies are all these things that despite all these things being quite ubiquitous, have this very very huge degree of complexity behind them, yeh, kind of motivating them or enabling them	
									X									0	1	1	6%	<div style="width: 0%;"></div>	<div style="width: 100%;"></div>	q4:6	there's some complexity qualifier there I guess, both a ubiquity and a complexity one	
			X						X				X				X	1	2	3	17%	<div style="width: 33%;"></div>	<div style="width: 67%;"></div>	q4:88	things that I guess we kind of consider to have some novelty	
			X						X				X	X			X	1	5	6	33%	<div style="width: 17%;"></div>	<div style="width: 83%;"></div>	q4:89	the workings of it are sort of complex beyond what simple inspection could reveal	
								X	X	X								1	2	3	17%	<div style="width: 33%;"></div>	<div style="width: 67%;"></div>	q4:9	things that enable, enable automation in some sense, but particularly things like communications technology they perhaps get conflated a little bit	
								X	X									1	1	2	11%	<div style="width: 50%;"></div>	<div style="width: 50%;"></div>	q4:90	those kinds of enabling communications technologies	
	X	X	X						X								X	3	3	6	33%	<div style="width: 50%;"></div>	<div style="width: 50%;"></div>	q4:91	a lot of the things we would consider technology are, you know, hidden, in a sense that the wires are in the walls and the switches are in the network cabinet and all the amazing technological processes that kind of actually make Farmville run	A loaded quote because of the hidden things to make run statement, which invokes conatus, vitality, and of course hidden to invoke closed system etc. This hidden vitality.
									X				X	X	X			0	4	4	22%	<div style="width: 0%;"></div>	<div style="width: 100%;"></div>	q4:92	perhaps I'd probably have a much better idea of why it's not working, it might be some behaviour manifesting, ah, that's probably that	
		X			X	X	X											4	0	4	22%	<div style="width: 100%;"></div>	<div style="width: 0%;"></div>	q4:93	you're going to have to agree with three sort of layers of premises	Premises as actants because of implied human.
						X							X					1	1	2	11%	<div style="width: 50%;"></div>	<div style="width: 50%;"></div>	q4:94	that's a fully straightforward chemical process but by god there's something magical going on there	Another magical realist moment, where straightforward is 'describable' but magic is 'irreducible'. Conflicted realities.
2	12	21	26	9	15	23	18	18	10	17	13	6	12	10	13	28	17	144	126	270	19%	53%	47%			



Figure 33- Network Diagram of Simultaneous Coded Quotes





## Appendix 3.0: Encounters and Observations

The following series of figures in appendices 3.0 to 3.5 explain schematically how encounters and observations have generated sources relevant to this projects examination of Augmented Reality technologies. The figures are an illustrative progression from a point of origin for the project, an enquiry into the migration of media between place and information spaces, through to the faceted inspection of im/mobilities amid complicated or complex formations of media and technology.

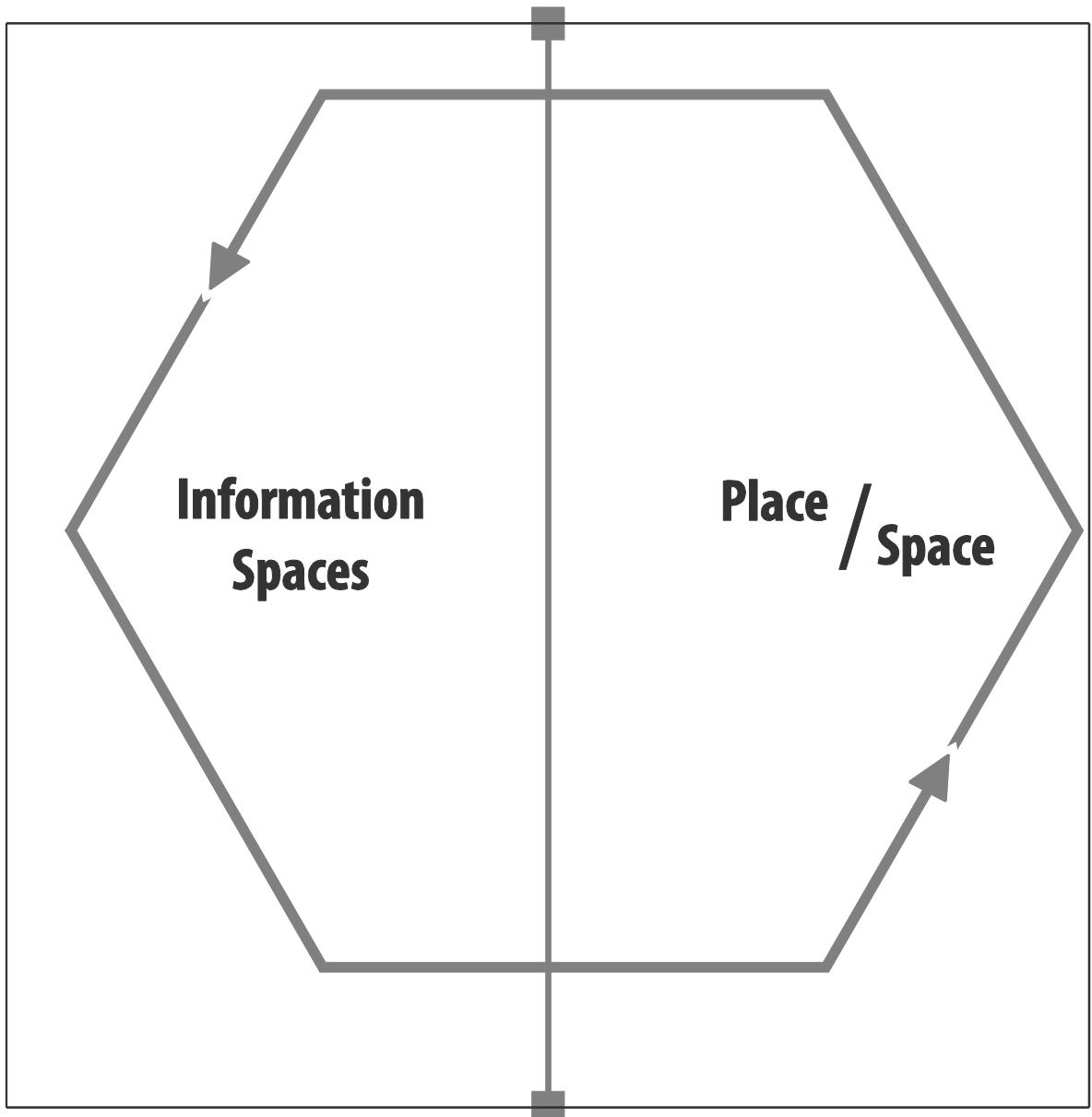


Figure 34 - Migration Between Place & Information Spaces

### Appendix 3.1: Reciprocal Relations

The simple offline/online distinction has been dispensed with as a misplaced categorical separation of immaterialisms of media and technology that are as much a part of plural realities as their material counterparts and embodiment. This is a deliberate attempt to avoid a naïve distinction of virtual and reality by dismissing the notion of the information spaces as a removed 'virtual reality' that is connected with. Instead, the spatial occupation of Augmented Reality as an embodied hand-held device used to create and consume spatial relations is paired with the interoperable information spaces that it depends on. Those interoperable information systems are also recognised as occurring within cyclic reciprocal relations that create and consume.

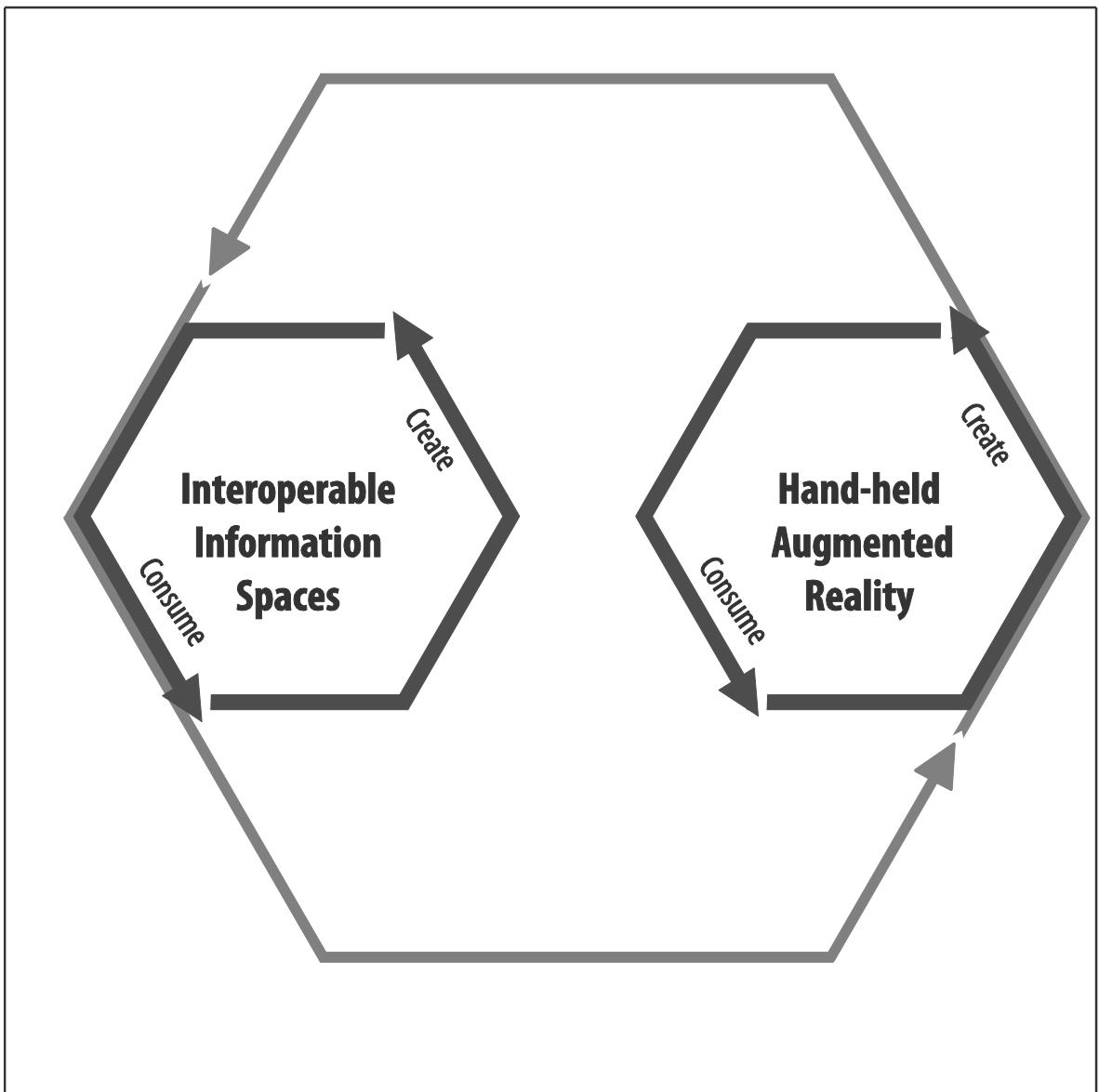


Figure 35 - Reciprocal & Migratory Relations Between Place & Information Spaces

### Appendix 3.2: Sites Amid a Broad Collection of Things

The pairing of hand-held augmented reality with interoperable information spaces occurs amid a broad collection of things. The 'occurring' is a spatial and experiential separation of Place and Space while recognising the distinction is a fluid overlap possibly conflated. The broad collection of things being those contingent and distributed technologies and media that occupy spaces and manifest, evolve and interoperate over time. A number of sites to encounter and observe these circumstance exist and are represented by the smaller scale hexagons in figure 36.

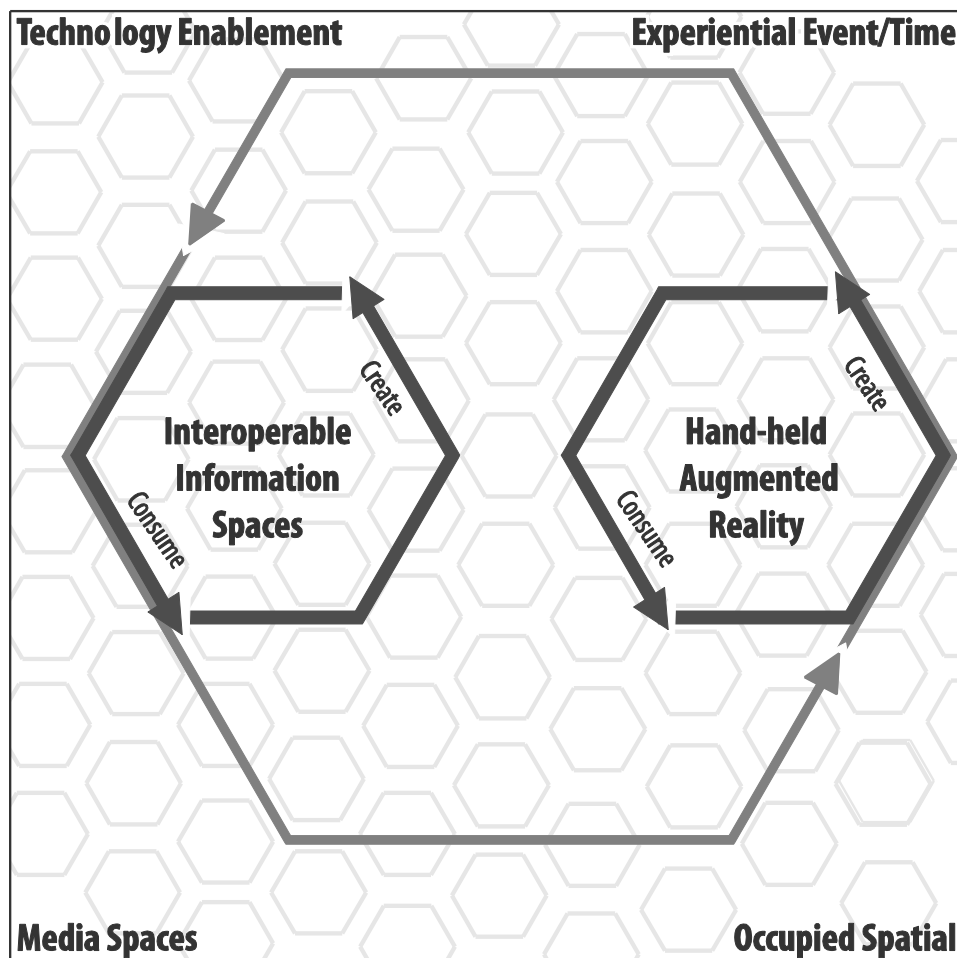


Figure 36 - Distinct and Interoperable Sites



### Appendix 3.3 Encounters & Supporting Evidence

A series of encountered enablers can be identified in multiple quadrants and plotted as actants into the schematic:

1. Departure Screens with Gate Numbers and in Seats
2. Windscreens and airplane windows, real screens of travel
3. A Sony HX5V Camera
4. A photo collection
5. The EXIF Spec
6. Global Positioning System Hand-held Receiver
7. Panoramio Photo Album Service
8. iPhone 3GS
9. WIFI
10. iOS Location Services, data file and accompanying legal case files and explanations
11. The Layar App
12. Panoramio Layer for Layar
13. Atiu Geology and Geography (the makatea, lagoon, caves, coast, rural and village areas)
14. Global Positioning System Space Segment

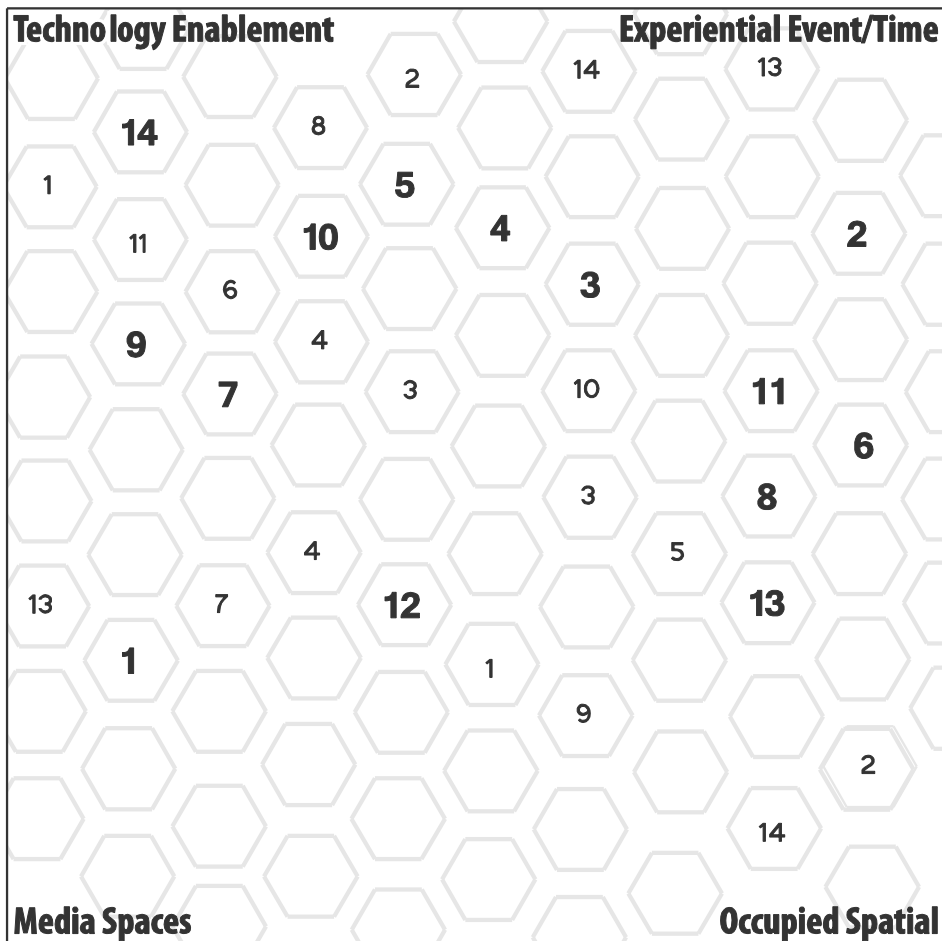


Figure 37 - Encounters with Interoperable Actants



### Appendix 3.5: Encounters and Observations at Multifaceted Sites

The descriptions and interpretations of encounters and observations recognise the situ of sources amid a multifaceted network of collectives and confederations. The shards excavated from amid the indescribability of vast and distributed interoperable media technologies are recognised as being a partial facet to some other arrangement that might be complicated or complex formations and re-figurations. The original imprint of this project's enquiry is retained as shaded areas to remind of the attention given to hand-held Augmented Reality and interoperable information spaces in reciprocal creative and consumptive relations.

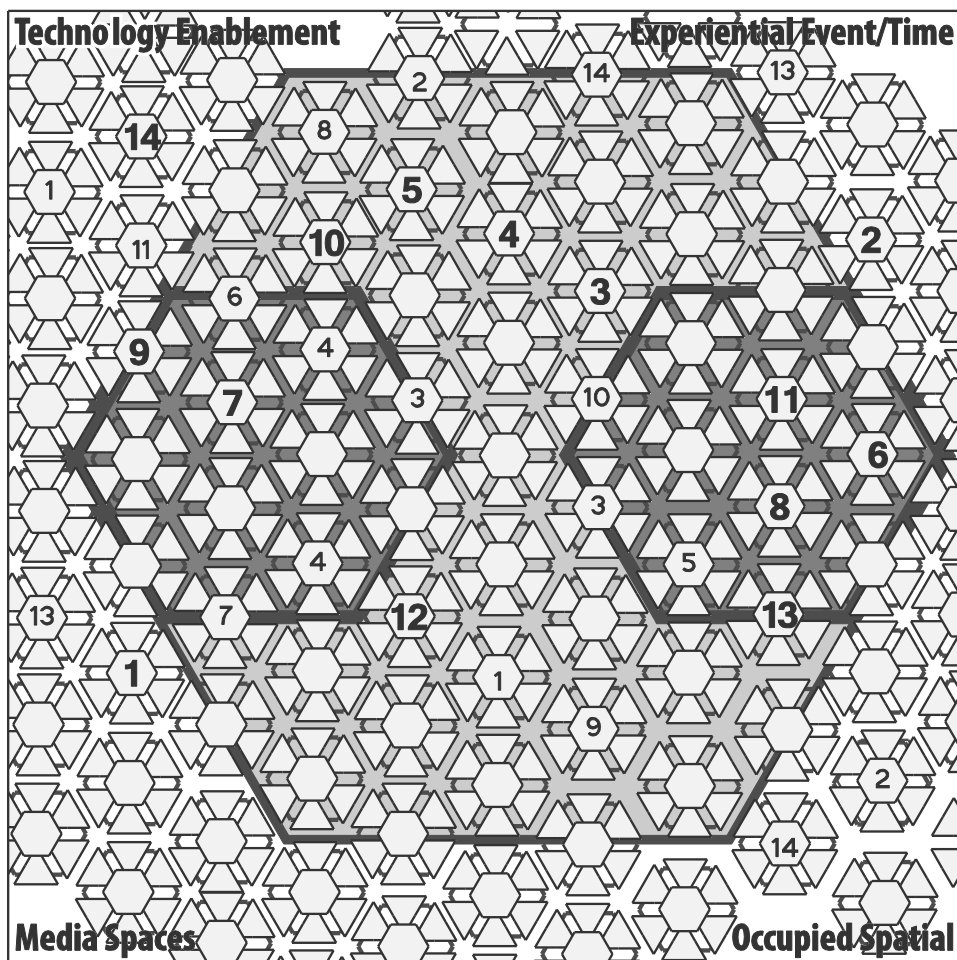


Figure 39 - Multifaceted Sites