

Objects in Flux

the consumer modification of mass-produced goods

Scott Mitchell

A thesis submitted in fulfilment of the requirements for Doctor of Philosophy
School of Architecture and Design
Design and Social Context Portfolio
RMIT University
March 2011

Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Scott Mitchell

31 March 2011.

Acknowledgements

For editing skill and patience: Georgina Laidlaw, Phip Murray, Saskia Schut, Jon Symons and Bianca Hester.

For research assistance and encouragement: Lara Stanovic, Glenn Mitchell and Anita Bacic.

For support and friendship: Spiros Panigirakis, Terri Bird, Andrew Sinclair, Charlie Sofo, Jonas Ropponen, Hilary Jackman and Jeph Neale.

Supervisors

Dr Soumitri Varadarajan

Dr Pia Ednie-Brown

Contents

| | |
|--|----|
| Abstract | 11 |
| 1. Introduction | 12 |
| 1.1 Overview | 13 |
| 1.2 Consumer production | 15 |
| 1.3 Current literature | 17 |
| 1.4 Method | 20 |
| 1.5 Chapter outline | 23 |
| 2. Rethinking Objects | 26 |
| 2.1 Introduction | 27 |
| 2.2 The social construction of objects | 28 |
| 2.3 Materiality | 29 |
| 2.4 Function, narrative, and belonging | 32 |
| 2.5 The politics of use | 34 |
| 2.6 Conclusion | 35 |
| 3. Remaking Things | 36 |
| 3.1 Introduction | 37 |
| 3.2 FIX | 37 |
| 3.3 The modification experience | 47 |
| 3.4 Objects and things | 48 |
| 3.5 Conclusion | 50 |

| | |
|--|-----|
| 4. Hacking, Modding and DIY | 52 |
| 4.1 Introduction | 53 |
| 4.2 Hacking | 55 |
| 4.3 Modding | 60 |
| 4.4 DIY | 71 |
| 4.5 Common ground | 75 |
| 4.6 Conclusion | 77 |
| 5. Telling Stories | 78 |
| Cylindric ultrasonic bat detector | 79 |
| Woz is God, or possibly the antichrist | 96 |
| 5.1 Introduction | 79 |
| 5.2 How-To narratives and build logs | 80 |
| 5.3 Fictional narratives | 91 |
| 5.4 Disembodied knowledge | 93 |
| 5.5 Embodied knowledge | 96 |
| 5.6 Transformative journeys | 100 |
| 5.7 Conclusion | 102 |
| 6. Strategies of Control and Tactics of Use | 104 |
| 6.1 Introduction | 105 |
| 6.2 Interpretative flexibility | 106 |
| 6.3 Control mechanisms | 108 |
| 6.4 Apple repair manuals | 111 |
| 6.5 RetroPod | 112 |

| | |
|--|------------|
| 6.6 GI Joe | 113 |
| 6.7 Sony Aibo | 114 |
| 6.8 Pentalobe screws | 116 |
| 6.9 iPodLinux | 117 |
| 6.10 Tactics of use | 119 |
| 6.11 iPod Social Outreach Program | 120 |
| 6.12 User-generated content. | 123 |
| 6.13 Non-concurrent collaboration | 124 |
| 6.14 Shared space | 125 |
| 6.15 Conclusion | 127 |
| 7. Conclusion | 128 |
| 7.1 Overview | 129 |
| 7.2 Revolution | 130 |
| 7.3 Freedom | 131 |
| 7.4 Do iPod owners really need social welfare? | 133 |
| 7.5 Rethinking the object as public space | 134 |
| 7.6 Gaps in the research and future directions | 134 |
| 7.7 Active engagement | 136 |
| Table of Images | 139 |
| Bibliography | 145 |
| Appendix | 153 |
| List of projects | 153 |

Abstract

This research investigates practices of object modification with specific focus on the consumer modification of mass-produced goods. Such practices present a diverse array of activity, ranging from car customisation to the remaking of domestic appliances. As an amateur leisure-time pursuit, these practices typically operate outside the commercial processes of design and manufacture. As such, they are often positioned as deviant interventions or interruptions to the object's 'normal' operation and may be actively suppressed by manufacturers. Despite this marginalised status practices of object modification represent a large body of productive activity operating within contemporary society.

Taking a participatory approach, this research develops a number of 'hacking' and 'modding' projects that connect with online communities and mirror existing traditions within practices of object modification. What emerges from this engagement is a complex story, or rather a number of overlapping stories that speak of the relationships we form with objects and the affordances given within contemporary society for reshaping these relationships. The stories told here trace the forces that bind consumer practices and the lines of flight by which consumers and objects escape their socially normalised position to become something other. Through this research the homogenous, mass-produced object is revealed as a site of diverse activity, a space for shared experience, and a platform for communal experimentation.



1. Introduction

1.1 Overview

Within the contemporary consumer landscape objects are accompanied by a plethora of media representations: manufactured narratives of use, lifestyle scenarios, social aspirations, fears, and desires. No longer conceivable as a supplement to the object, this textual space becomes the field from which the object is constituted. When an individual engages an object it is this discursive territory that must be negotiated and it is here that the possibilities for the object are given. While objects have always had this textual appendage (Cummings, 1993), it is arguable that never before in our history has the discursive environment been so expansive, so highly structured and so heavily policed (Lessig, 2004). Within this manufactured space, object use is determined and enforced through a combination of media campaigns, product warranties, license agreements, operational instructions and proprietary, non-serviceable technologies. The end user, captured by the expansionist, capitalising system, is forced to play out the role that has been set them – or so it would seem. But amidst this highly controlled environment a divergent narrative emerges. Consumers take up the objects of mass-production and remake them to match their own desires.

Practices of object modification, appropriation, miss-use and re-use present a long and diverse history. It would be fair to say that such actions are an integral part of our engagement in the world and are

[Figure 1-1 - facing page]
Cantenna wireless antenna,
constructed from a Golden Circle fruit
juice tin, 2004.
Image is author's own.

1/ De Certeau links these everyday ways of operating to our evolutionary development and 'the immemorial intelligence displayed in the tricks and imitations of plants and fishes' (p.xix)

therefore not at all extraordinary.¹ However, when faced with the normalized and highly scripted products of mass-production these actions take on an unusual and often disruptive quality. When objects of mass-production are re-made or re-contextualised the result can be arresting. The field of product design presents many examples of such practices, from the Castiglioni brothers' *mezzadro* stool (1957); Charles Jencks's *Ad hoc radio*; Nathan Silver's *Dining Chair* (1968); Ron Arad's *Rover Chair* (1981); Frank Schreiner's *Consumer's Rest* shopping cart chair (1983); Tom Dixon's *Creative Salvage* group from 1984 and his latter publication *Rethink* (2000); Jasper Morrison's *Readymade* products from the 1980s, followed by Renny Rainmaker's re-discovery of the practice in the 1990s with the numerous recycled and reused products grouped under the *Droog* brand; and the current abundance of recycled design objects from groups such as *Castor Canadensis* and *Reestore*. While this field provides a long and fascinating history this research project is less concerned with strategies of professional design than it is with amateur production and the various uses and misuses individuals find for the objects in their possession.

Such practices can often be found in situations where social, economic, or material constraints limit the availability of goods and services. Two recent publications, *Home-Made, contemporary Russian folk artifacts* by Vladimir Arkhipov (2006) and *Prisoners' Inventions* by artist group Temporary Services (2003), give particularly interesting accounts of such practices. *Home-Made, contemporary Russian folk artifacts* documents Arkhipov's collection of unique hand-made objects from the former Soviet Union. Presented together with stories of their creation, the book is a record of life under communism, where material shortages forced the general population to 'make do'. The objects, improvised from the disparate materials available, present innovative and fascinating solutions to the most mundane of problems: bicycle wheels and forks pressed into service as television antennas, boot heels used as bath plugs and buckets remade as shovels. These ingenious acts of material manipulation are born out of scarcity and need.

Likewise, *Prisoners' Inventions* documents tools developed within the restrictive environment of the United States penal system. These objects are easily understood in terms of function and necessity – here, that well-worn mantra 'necessity is the mother of invention' rings true.

However, practices of object modification are not confined to domains of impoverishment or lack. As Arkhipov states in the foreword to his book, ‘The folk phenomenon of the home-made production of functional everyday items is wide scale, spontaneous, and largely unknown. Such things have always been with us, and can be found in any country in the world.’ (2006, p.5)

1.2 Consumer production

This research focuses on practices of object modification within a contemporary consumer environment – a domain that is not defined by scarcity of material resources, but rather by excess. It has been argued however, that within the excesses of consumer culture, the individual suffers from an entirely different form of lack (Jencks & Silver, 1972; Slater, 1997). Confronted by the showy products of mass-production the consumer has little opportunity to participate in the production of their own life and may become alienated from their material environment (Slater, 1997, p. 106). In forging divergent paths through the consumer environment, practices of object modification may be seen to provide a degree of resistance to this alienating effect.

By taking up the term ‘consumer’ to describe the focus of this study, I am locating practices of object modification on one side of a traditional producer-consumer binary relation. This approach provides a useful boundary to the study, but it also makes a claim as to the nature of this amateur production, i.e. that the practice is largely structured through a producer-consumer relationship. Establishing the nature of this binary relation is not straightforward. As Michel de Certeau makes clear in *The Practices of Everyday Life*, the division between production and consumption can not be drawn along lines of geographic distribution, of places of work or leisure, or via the activities undertaken, but must instead be established through ‘modalities of action’ (1984, p. 29). What distinguishes producers from consumers is the producers’ ability to claim a space as their own and to dictate the ‘proper’ use of that space. By contrast, consumers can only ‘use, manipulate, and divert these spaces’ (1984, p. 30). Despite the consumer’s marginalised status, de Certeau argues that ‘users make (*bricolent*) innumerable and infinitesimal transformations of and within the dominant cultural economy in order to adapt it to their own interests and their own rules’ (1984, p. 31).

This understanding – that acts of consumption are, in themselves, productive – has over the past 30 years become widely accepted. As Don Slater states ‘most of us... are very far from being mindless consumerist zombies. We can and do reinterpret, transform, rework, recuperate the material and experiential commodities that are offered us’ (1997, p. 211). A number of terms have been advanced that seek to better describe this productive, participatory aspect of consumption; on various occasions consumers have been recast as prosumers (Toffler, 1970, 1980) and produsers (Bruns, 2007, 2008). The emergence of these terms should not, however, be taken as indication of a collapse in the binary division between production and consumption, for although these terms describe a specific shift in the nature of consumption, the fact remains that centralised processes of mass-production and their associated modes of consumption continue to dominate contemporary capitalist society. That acts of consumption are themselves productive does not generally alter the power relations that exist within this dynamic or the subjugated nature of the consumer. While this research finds clear indications of individual agency within acts of consumer production it also recognises that the field of consumption is a highly controlled domain. As de Certeau asserts, acts of consumer production remain contingent on dominant economic structures: ‘power relationships define the networks in which they are inscribed and delimit the circumstances from which they can profit’ (1984, p. 34). As such, consumers operate in a domain that is not their own, yet within this domain they establish a degree of plurality and creativity; adopting a tactical approach, they turn the situation to their own advantage.

In aligning the practices of hacking and modding with de Certeau’s claim that consumers ‘make something’ of the goods and services they consume, there is a risk of appearing stupidly literal. The ‘making’ that concerns de Certeau is of an entirely different order, one based in everyday actions or ‘ways of dwelling’, that ‘shows itself not in its own products (where would it place them?) but in an art of using those imposed on it’ (1984, p. 31). Yet despite de Certeau’s insistence on the ‘quasi-invisible’ nature of consumer production, everyday acts do produce material artefacts. De Certeau recognises as much when he speaks of *la perruque* (the wig), a practice where employees disguise their own work as the work of their employer. The products of this

clandestine labour – a love letter written on company time or a piece of domestic furniture made on the factory’s lathe – clearly have a material presence in the world and a place within people’s lives. For de Certeau, writing in the late ‘70s, the steadily increasing systems of production (television, urban development, commerce, etc.) left consumers no place in which they could indicate what they made or did with the products of these systems (Certeau, 1984, p. xii). As de Certeau states, ‘the television viewer cannot write on the screen of his set’ (1984, p. 31) – but the situation has since changed. The rise of the Internet has seen a significant shift in the nature of media production; many consumers within capitalist societies now regularly ‘write on the screen’, in the form of blog posts, video uploads, photo sharing and forum contributions. In doing so they have transformed the contemporary media environment.

This research finds that consumers actively seek out and create places in which to speak about the things they consume, whether that be on the Internet (Torrey, McDonald, Schilit, & Bly, 2007), in the street (Moorhouse, 1991), within the domestic environment (Atkinson, 2006) or in the pages of hobbyist magazines. These narratives of consumption add diversity to the discursive space of the object and expand the possibilities of use. While practices of object modification are not the unrepresented and unsigned acts of de Certeau’s study, their position within a consumer environment makes his analysis particularly relevant. By examining these practices through their modalities of action we may begin to see the forces that shape consumer practices and the degree to which consumers can resist or escape commercial interests.

1.3 Current literature

Literature surrounding the consumer modification of mass-produced objects has, over the past ten years, become increasingly prominent. One of the first domains to receive widespread study was the field of computer game modification. Here, the easily distributed digital products of consumer production, items such as alternative game characters, game conversions, and user-generated editing tools, were seen to have a significant impact on game usage and to play a major role in the computer game industry (Au, 2002; Kücklich, 2005; Nieborg,

2005). Beyond this narrow domain numerous recent publications have examined the broad economic benefit to be gained from practices of consumer production. Often cast as ‘open innovation’, consumer production has been recognised as a cost-effective alternative to commercial research and development (Chesbrough, 2006; Goldman & Gabriel, 2005; Thrift, 2006; Von Hippel, 2005). In the book *Democratizing Innovation*, Eric von Hippel cites examples of user innovation from fields as diverse as windsurfing and open source software, claiming that practices of consumer production are becoming increasingly common within contemporary society (2005).

Likewise, Charles Leadbeater and Paul Miller suggest we are in the midst of a ‘pro-am revolution’ where ‘innovative, committed and networked amateurs working to professional standards’ are creating new organisational models that challenge traditional corporate and state modes of production (2004, p. 9). *En-masse*, consumer activity has been conceived as a swarm or cloud of productive potential that, until recently, has remained largely untapped (Corney, Torres-Sanchez, Jagadeesan, & Regli, 2010; Gloor, 2006). The general consensus amongst these texts is that this new era of consumer production has been instigated by a dramatic shift in communication technologies. In particular, the emergence of the Internet has allowed for distributed media production and knowledge sharing on an unprecedented scale (Benkler, 2006).

It is worth noting, however, that this revolution has been a long time coming. In the 1972 publication *Adhocism* Charles Jencks imagined a ‘resource-full computer’ that would allow for ‘decentralised design and consumption based on individual desire’, a combination of ‘Hippie consumer tactics and the space program’. Jencks states that ‘With an electrified consumer democracy, the time spent and the cost of consumption would plummet, and the impersonal subsystems of large corporations would be repersonalized by combining them ad hoc towards specific ends’ (1972, p. 55). Jencks and Silver propose adhocism as a panacea to forces of determinism, specialisation and bureaucracy within modern society that frustrate natural creativity and self-realisation (1972, p. 19). While envisaging a new wave of ‘consumer democracy’ where individuals actively participate in the construction of their environment, Jencks and Silver also recognised

that practices of consumer production are already prevalent within our daily lives.

In a contemporary study of consumer production Brandes, Stich and Wender coin the term ‘non-intentional design’ to describe these everyday acts of object modification. Clearly intended to highlight the ubiquitous nature of these acts, the term brings with it the ‘quasi-invisibility’ found in de Certeau’s writing. Brandes et al claim that within acts of non-intentional design ‘there is no impulse to consciously create’ (2009, p. 12). However, in presenting examples of non-intentional design, Brandes et al are constantly in danger of slipping beyond their narrow definition; much of the productive consumer activity surveyed in the text shows evidence of conscious design decisions. While attempting to highlight a certain poetic quality within ad hoc production Brandes et al deny practitioners their capacity for self-reflexive action.

In a similarly disempowering yet opposite movement the design book *Remake it Home* locates amateur production within a Eurocentric design tradition. In the introductory text, titled ‘Design is the Daddy, Necessity is the Mother’, Henrietta Thompson states that ‘While in the past such thrifty measures have been associated with times of need, gradually they are being revived by artists, designers and eco-warriors alike, finding fans in more affluent and image-conscious circles’ (2009, p. 11). By positioning professionally designed objects as the inspiration for amateur production the publication acts as a colonizing force, claiming the language of object modification as its own and perpetuating the authoritative voice of a design elite.

One must question the need to situate consumer production within a professional design tradition. While design practices have repeatedly ‘discovered’ object modification as an alternative form of production, it is dubious whether the profession is responsible for a revival of these practices. In fact, it could be argued that the ‘innovative’ forms of design cited by Thompson stifle consumer participation. As Brandes et al note, ‘expensive objects demand that we treat them with respect... therefore, freedom of use, and thus also the potential for NID [non-intentional design] applications, is largely compromised’ (2009, p. 124). This argument may also be made for designer objects that have been invested with cultural capital. For the most part, however,

practices of consumer production pay little attention to European design traditions or to the 'affluent and image-conscious circles' referred to by Thompson.

Research into the qualitative aspect of consumer production is currently quite limited, however studies from the domain of computer-human interaction (CHI) are beginning to address this field. Through observation, participant interviews and workshops these studies have identified various traditions within practices of consumer production and have gone some way towards describing practitioner motivation (Buechley, Paulos, Rosner, & Williams, 2009; Kuznetsov & Paulos, 2010; Torrey, et al., 2007). These studies focus mainly on the use of computer-based technologies within consumer practices and the various means by which practitioners use these technologies to make their activities public.

Largely missing from these studies however is an account of the modification experience. While this discussion is absent from academic discourse, such accounts are prevalent within the practice itself. Consumer production is a highly self-reflexive practice and practitioners are not separate from, nor blind to, the meanings they create. Consumers actively construct narratives of use that position their actions within a specific social field and belief structure. These narratives give valuable insight into the nature of consumer practices and the participant experience.

1.4 Method

This research operates in the gap between academic discourse and amateur practice-based accounts of consumer production. The research was undertaken through a project-based model that involves active participation within the field of object modification. In adopting an observant participant approach the research is itself an amateur engagement with the field of object modification, however this engagement operates within an academic frame. Stories of object modification, initially developed within the practice, are later reflected upon within the academic context.

The research began with the question:

How does an object become something other than what it is?

This initial question led to material explorations and, in turn, to four additional questions:

What is the qualitative experience of modifying objects?

How are practices of object modification represented within society?

Under what conditions do practices of object modification take place?

And, finally:

What possibilities do practices of object modification hold for the amplification of consumer agency?

These questions were explored through an extended engagement with the field. For a period of six years I participated in the practice of object modification, developing a range of hacking and modding projects and connecting to online modding communities. This exploration was recorded through numerous photographs and written documentation. Many of the projects developed for the research were published on my personal blog site in the form of step-by-step narratives that allowed members of the public to follow the project's development and leave comments. In addition to documenting the activities being undertaken, this online content formed an integral part of the projects themselves, providing a discursive dimension to the practice and contributing to a shared dialogue.

As an observant participant I played a central role in the research (Kaminski, 2004). My presence is reflected in a number of images throughout the exegesis. These images bring a level of anxiety; I would like to erase them, to remove myself from the picture and put some distance between myself and the research. However, as Donna Haraway states, eliminating the personal from academic writing produces 'the God-trick' (1991, p. 189), a disembodiment of vision that perpetuates the myth of a disinterested observer that 'sees everything from nowhere'. Of course, vision is never from nowhere. It is, as Haraway claims, always situated within a knowing subject and is therefore always motivated and partial. John Law has argued that 'letting the personal in' offers an 'alternative notion of objectivity' (2000, p. 5), one based in partial connections and multiple viewpoints. By acknowledging my own position within the research I can give an account of this partial vision and remain attentive to the types of knowledge this situated vision generates. There is however an additional reason for my focus on the personal. It is my contention that

the construction of the subject is of particular relevance to the practice of object modification. This is partly due to the fact that the remaking of objects infers a remaking of a subject-object relation, but more than this, that the practice of object modification is a transformative journey in which the subject actively remakes themselves, incorporating new knowledge and new modes of being.

My journey to become a modder began long before I embarked on this research. I was perhaps ten when my father, a high-school science teacher, employed me, and my twin brother, to salvage electronic components from discarded circuit boards. Some years later, at the age of fourteen, I watched my brother build a crude scanner from the families' dot matrix printer and computer joystick. Later still, and again with my brother, I visited an anonymous garage in suburban Melbourne where, for a small fee, a retired engineer inserted a mod chip into our Sony Playstation games console. By the time I commenced this research at the age of 33 I had hacked, modded and repaired numerous objects. Although I was familiar with these practices I did not consider myself a hacker or modder – my main identity was given through my occupation as an artist.

This research has a strong relationship to my art practice and at various times throughout the research I have used art galleries and artist-run spaces to aid in the development of the project. At one level the decision to use these spaces was a pragmatic one – my pre-existing association with art institutions provided a convenient means by which I could gain access to a public audience. At a second, more fundamental level the research extends a line of enquiry that has been present in my art practice for many years. Central to this enquiry is a strong interest in objects. Since 1998 I have been exploring the properties of objects within my art practice: their functioning, their social meaning and, most importantly, their ability to change, to take on new functionality and new meaning structures to become something other. It was this line of enquiry that led me to undertake the current research.

Given the research project's close relation to art practice, it would be possible to examine the project through the lens of art theory. Of particular relevance may be an exploration of relational aesthetics in connection with the participatory nature of the project. I have how-

ever chosen not to explore this path within the exegesis. The reason for this stems from the field of study itself. Although practitioners often describe their creative acts as art, their involvement within a contemporary art community is generally quite limited. Rather than bring a foreign voice to bear upon the practice I have attempted to discuss practices of object modification in terms that remain attentive to the concerns of those working within the practice. The field of art is therefore largely ignored within the following text; instead the discussion centres on individual agency, mechanisms of control and stories of resistance.

1.5 Chapter outline

This research has resulted in both project outcomes, in the form of material and textual artefacts, and an accompanying exegesis (this document) that reflects on the projects and conceptualises them within a broader theoretical framework. While the exegesis gives insight into some of the projects undertaken it does not account for all project activity, nor should it be regarded as a key through which knowledge is extracted from the projects. The exegesis constructs its own knowledge and its own ways of knowing. Likewise, the projects themselves hold their own unique form of knowledge that exists independently of this text. These two components, the projects and the exegesis, offer two distinct paths by which the research may be known. To access the projects it is necessary to visit the project website and engage with the stories of modification presented there.² A project overview is also given in the appendix of this document. To gain a comprehensive understanding of the research, it is recommended that both the exegesis and the project website be engaged.

2/ <http://www.openobject.org/objectsinflux>

2. *Rethinking Objects*

In this chapter the object is explored through a range of theoretical texts that emphasise the socially constructed nature of object identity. From this exploration the object emerges as a complex set of relations given through personal and social narratives of use. Stable object identity is achieved through the repeated articulation of these narratives, however this repetition also brings the possibility of deviation. Caught in a perpetual state of production, the object becomes a site of struggle where disparate interests meet and negotiate shared meaning structures.

3. Remaking Things

Chapter 3 documents my initial investigations into object modification and discusses the nature of the modification process. Through the construction of a public art event called FIX the research collected a number of faulty objects from members of the general public and attempted to fix these objects in innovative and unexpected ways. These material explorations present the act of modification as a complex negotiation between various cultural values, personal histories, functional language, and material constraints. Object modification is found to be a process of rethinking the object from within, of finding a path within the object by which it may become something other.

4. Hacking, Modding and DIY

This chapter turns its attention to everyday acts of object modification. Taking a broad approach, the text examines practices of hacking, modding and DIY and their representation within society. From this diverse array of productive activity a general overview of these practices is developed and a number of common themes emerge. Practices are seen to privilege individual agency and creative play. While they are often anti-authoritarian in nature they are also highly social with practitioners actively seeking out parallel projects and like-minded individuals. The public dialogue that emerges through these connections is highly self-reflexive and privileges the free and open exchange of information.

5. Telling Stories

Chapter 5 examines the discursive space generated by practices of object modification. The chapter is presented through two parallel streams; the main body of the text is taken up by stories from the field of object modification while the theoretical reflection on these stories is pushed to the margin. The intent here is to acknowledge that practices of object modification are sites of diverse production. This production is not simply materially based but also textual and social. The stories presented here mirror established forms of representation and engage a diverse community of practitioners. Taken together, these parallel texts describe a field of activity where participants actively construct their environment to match their beliefs and desires.

6. Strategies and tactics

Chapter 6 examines the various forces that shape the consumer environment and the effect these forces have on practices of object modification. Through a series of contemporary and historic examples the text identifies a number of commercial strategies that influence consumer behaviour. The image that emerges is one of a highly structured environment where producers dictate the objects proper use and limit the consumer's ability to creatively engage with the object. Despite this high level of control the research finds that consumers actively resist commercial strategies. Taking a tactical approach, consumers construct parallel narratives of use and form their own meaning structures.

Consumer agency and communal action are explored through the establishment of the iPod Social Outreach Program (iSOP), a free repair centre for iPods. This project finds that communally generated consumer-based knowledge is effective in challenging commercial control mechanisms and destabilizes the manufacturers position of authority.

7. Conclusion

In conclusion I examine the revolutionary potential of practices of object modification. A belief in free and open access to information is seen to be central to these practices and presents a fundamental challenge to the privatising force of capitalism. Following this logic, the research asks that the mass-produced object be rethought as a form of distributed public space. In recognising the space of consumption as communal and discursive we can begin to acknowledge the freedoms that have been sacrificed for the sake of commercial gain and the paths by which these freedoms may be reclaimed.



BKE-566

VICTORIA-GARDEN STATE

2. Rethinking Objects

2.1 Introduction

Much of the time, in our day-to-day lives, we treat objects as fixed, unchanging things; they exist for us in a ‘discourse of objectivity that allows us to use them as facts’ (Brown, 2001, p. 4). But objects are never simple, material facts – they are complex events. A range of social forces are at play within an object’s design and production, and further, within the sphere of consumption, where an object’s identity is formed and re-formed through various acts of engagement. The specific nature of these contexts, shaped by personal and social histories and the needs and desires of the constituting actors, produces a series of modulated object identities. Within this dynamic social field, objects exist in a state of flux.

Coming to an understanding of objects that both acknowledges their perpetual social production while giving adequate account of their material presence is essential for the development of this research, for if we are to interrogate what it means to re-make an object then we need to be clear about what, exactly, is being remade. With this in mind, the following text seeks to establish a general framework through which the project’s material and social adventures may be examined. Drawing heavily from science and technology studies, this chapter begins with an account of objects as ‘social constructs’. From here the role of materiality is brought into question and the intertwined natures of matter and meaning are explored. Further to this, an object’s

[Figure 2-1 – *facing page*]
Kitchen cupboard handle attached
to the boot of a Ford Falcon sedan,
Melbourne, Australia, 2004.
Image is author’s own.

stability within the social field is examined in relation to function and narratives of use. Narrative is found to be both a stabilising force and a means by which objects may be reinvented through changing social conditions. The chapter concludes with a discussion of the political nature of this reinvention. Through Michel de Certeau's conception of production and consumption as 'modalities of action', the object is established as a dynamic site where strategies of control and tactics of use play out.

2.2 The social construction of objects

In *The Social Construction of Facts and Artefacts*, Pinch and Bijker argue that both scientific facts and technical artefacts can be understood as social constructs (1984). This understanding draws on social constructionist theory based in the Sociology of Knowledge, which claims that meaning is constructed by human beings through an engagement with the world. Within this framework, all meaningful reality is socially constructed. Pinch and Bijker expand this theory to show how social forces shape technological developments and influence the form, function and meaning of technological artefacts.

The notion of 'social construction' stands in contrast to more traditional understandings of technology based in 'technical determinacy' where technology 'impinges on society from outside' (Cockburn & Ormrod, 1993, p. 8). From a determinist perspective, technology is driven by scientific discovery or moments of 'individual inventive genius' (Cockburn & Ormrod, 1993, p. 8). The effect of technology is thus seen as inevitable and society has a limited influence. Hence determinism acts as a conservative force that tends to 'preserve existing power relations and disguise the possibility for social change' (Cockburn & Ormrod, 1993, p. 8). Failure to recognise the social forces that shape technological change causes these forces to 'disappear' and technological change is made to appear 'natural'.

Rather than looking to causal relations outside the social sphere, constructionist theory maintains that meaning arises from the interactions between elements within society. The social connectedness of these elements and the ways in which meaning is produced has been understood through various theories of structuralism, social phenomenology, poststructuralist textualism and intersubjectivity (Reckwitz,

2002). From a structuralist position, meaning arises out of difference. This is, as Saussure establishes in his description of language, difference 'without positive terms' (Saussure, Bally, Sechehaye, Riedlinger, & Harris, 1983, p. 118); i.e. positions within the field of difference have no essential meaning in or of themselves; when this idea is formed through their relation to one another. Applied to the broader field of material culture we see that an object's identity is not fixed within the materiality of the object, but arises from the connections it forms with other entities.

From a post-structural position identity may be regarded as never fully present, remaining instead in a state of continual deferral and contingent on the traces of past iterations. As Geoffrey Bennington states: 'difference is the milieu in which identities are sketched but never quite achieved, but never quite lost' (1998, p. 553). Hence, an object's identity becomes sketched out as it is re-encountered across multiple divergent contexts. The object, never fully present, emerges as a set of shifting relations. Within this shifting milieu the illusion of stability arises from the normalisation of relations achieved through repetition of action and the forgetting of these differences.¹ Seemingly stable, objectified, social institutions are produced and re-produced in the contexts of social actors' active participation in their life-worlds (Berger & Luckmann, 1984; Schutz & Luckmann, 1974). It is through these multiple encounters that the object is established as a permanent, self-contained entity. This process of objectification obscures the shifting social nature of objects, making their functions and meanings appear to be fixed within the materiality of the object.

2.3 Materiality

Matter complicates things. Within theories of social construction there are different views regarding the significance of material factors (Cockburn & Ormrod, 1993, p. 8). In many cases materiality appears to occupy a marginal position, functioning as a supplement, an 'element added to something already complete in itself' (Reckwitz, 2002, p. 195). Material entities are often cast as 'objects' that 'gain a symbolic quality within classification systems, discourses or language-based interaction' (Reckwitz, 2002, p. 202). As such, objects become 'visible' only within the context of 'systems of meaning'. Material entities are thus construed as carriers of meaning, as 'objects of knowledge'.

1/ This process of forgetting is similar to Nietzsche's description of the Platonic idea in language: 'Every concept originates through our equating what is unequal. No one leaf ever equals another, and the concept of "leaf" is formed through an arbitrary abstraction from these individual differences, through forgetting the distinctions; and now it gives rise to the idea that in nature there might be something besides the leaves that would be "leaf" – some kind of original form after which all leaves have been woven, marked, copied, colored, curled, and painted, but by unskilled hands, so that no copy had turned out to be a correct, reliable, and faithful image of the original form' (Nietzsche, 1954, p. 46).

Reckwitz questions whether such a conceptualisation ‘gives just due to the significance which material artefacts bear in the social world’ (2002, p. 206), arguing that, in seeking to position culture as the primary site of meaning, theories of social construction tend to cast materiality as ‘non-cultural’. This, Reckwitz asserts, reveals a classical dualism between idealism and materialism. ‘The material world thus appears as the plane of objects to be known or to be observed’ (2002, p. 206). With such a schema, the object produces a doubling effect, appearing to exist in two realms: on the one hand a realm of intelligibility given through socially constructed meaning, on the other a realm of materiality equated with the object’s ‘presence’ in the world.

Such an account obscures the intertwined nature of matter and social forces. With regard to technological artefacts, materiality is formed through human action and as such the specific material qualities of an object result from the social forces active during the object’s design and production. Further to this, the materiality of the object operates as a social force. If social institutions are produced through the active participation of social actors in their lifeworld then this participation is necessarily a material one, and the material qualities of objects describe the form this sociality may take. Finally, meaning can be neither simply read off an object nor applied to it, but must arise from the field of relations in which the object is inextricably embedded. This field of relations is at once social and material.

What becomes evident from the above understanding is the necessity of casting materiality as both a site and a constituting element of socio-cultural production. Placing materiality within a social frame does not diminish the role materiality plays in shaping object identity, nor does it follow that materiality always acts in harmony with other social forces. Rather, an object’s materiality mobilises a particular set of forces and engages a distinct range of effects. One such effect is that matter renders a degree of permanence to the object and to the culture that surrounds it, solidifying social relations in material form. Objects possess a material memory of the social conditions by which they were formed and they perpetuate these conditions through their roles in the performance of social practices – i.e. through their use.

As social relations shift with time an object may become dislocated from the forces that shaped its materiality. In speaking of Indigenous artefacts, Nicholas Thomas notes that ‘as socially and culturally salient entities, objects change in defiance of their material stability’ (2002, p. 125), and cites the example of museum collections where the genealogies of European representation ‘efface’ the intentions of the artefacts’ producers. Removed from its place of production, the museological artefact ceases to function as bowl, basket or idol, but instead adds its weight to the logic of the ‘collection’. Taking up the role of representation, these artefacts are made to speak of other places and other people. The manner in which museum artefacts speak of the ‘other’ says as much about the host institution’s forays into foreign lands as it does about the cultures from which the artefacts have been collected.

This ability for an object’s meaning to shift demonstrates that ‘material presence is neither completely held nor absolutely determined by the structure of meaning in which it is articulated’ (Benjamin, 1993, p. 32).² Andrew Benjamin argues that this is partly due to the fact that ‘matter, while always presented in terms of function, does not lose its materiality once the given function no longer pertains’ (1993, p. 32). When an object’s original function is lost or obscured, the object’s material continuity ensures that alternative relations, i.e. new modes of functionality and new forms of socially constructed meaning, emerge. This ability for the object to be recontextualised can be seen in the example of the telephone directory: while its primary function may be to collect together telephone numbers in one (or more) volumes, it remains open through virtue of its materiality to multiple divergent uses and may be found applied to the task of levelling unbalanced furniture, adjusting the height of a computer monitor, transforming adult seating into a child’s highchair, or, functioning as a door stop, a stool or step, a source of toilet paper, or a form of kindling. These new uses depend on the material affordances offered by the object.

The uses to which an object may be put are, however, never solely determined by the object’s material properties, for as Benjamin states, matter cannot be given without meaning (1993, p. 31). That is to say, any knowledge we have of an object is always given through modes of representation and therefore we cannot know the object without first having positioned it within a structure of meaning. This meaning

2/ Benjamin is concerned here with the operation of the ‘readymade’ in the western tradition of art, and the means by which everyday objects can be repositioned as objects of art.

structure affects our use of the object; a Bible, for example, although materially similar to a telephone directory, presents a significantly different set of social meanings when subjected to the previously stated divergent uses. The situation is, as Reckwitz claims, that ‘the material artefact influences – but does not determine – which practical understanding and, consequently, which kinds of social practices are possible’ (2002, p. 213).

Benjamin concludes that matter and meaning, while delimited by function, are never co-extensive. The possibility for the object to become something ‘other’ stems from this founding lack of co-extensivity, while at the same time ‘reproduces the impossibility of that closure in its transformation into an object’ (1993, p. 33). Here, producing an object can be understood as the unification of matter and meaning, an impossible closure made possible by social practices. Within this closure, matter and meaning are given as one; the object is at once material artefact and social practice. Beneath this unified façade, however, lie the divergent possibilities offered by matter, always in excess of any specific function to which an object may be put.

2.4 Function, narrative and belonging

An object’s stability – its ability to activate a consistent meaning structure – depends on its repeated articulation through that meaning structure, i.e. the repeated performance of a specific function within a specific social context. Function therefore acts as a grounding force, curtailing the countless excesses of matter and meaning by providing the object with a sense of purpose and belonging.

Although notions of function are often reduced to a mechanistic performance of materiality, function is always couched in narrative. In their paper on the domestic freezer in the United Kingdom, Elizabeth Shove and Dale Southerton show how these narratives of use shift and accumulate over time (2000). Subtle changes in freezer technology during the 1970s, ’80s and ’90s and enduring social conditions combine to produce shifts in the perceived role of the freezer. These changes are reflected in the various narratives used to promote freezer use in the UK (2000, p. 313). Shove and Southerton assert that this does not amount to an ‘unfolding narrative of a stable object’, but rather a ‘reinvention of the freezer’, claiming that ‘despite its persistently white disguise, the

chameleon-like freezer takes on the spots and stripes of its surroundings. It is, for instance, a symbol of modernisation in the 1970s, a pre-condition for domestic and economic efficiency in the 1980s and a device of convenience in the busy 1990s' (2000, p. 314).

Stove and Southerton demonstrate how such narratives are influenced by changing social conditions – freezers are established as 'necessary' appliances through the normalisation of freezer-dependent foods such as burgers, pizzas and ice cream (2000, p. 308). They also show how an object's functionality imposes certain demands on users, and structures narratives of use in specific ways – freezer use requires an understanding of the steps needed to prepare food for freezing or defrosting. The 'becoming normal' of the domestic freezer is therefore 'a two way process in which freezers respond to their surroundings and at the same time impose something of their own script' (2000, pp. 314-315).

Narratives of use position objects within broad social contexts and in doing so they 'make sense' of an object's functionality for a specific social group at a specific time. Such narratives are therefore crucial in the formation of meaning structures and the normalisation of objects within society. It may be argued, as Hackett and Lutzenhiser do in their analysis of the domestic refrigerator, that the consumer's understanding of what a particular object is for 'is a consequence, not a determinant, of their use' (1985; cited in Shove & Southerton, 2000, p. 315).

Narratives of use are frequently forcefully deployed along with the objects of mass-production, frequently leaving consumers with little room to move; 'gadgets and appliances script the actions of their users in ways which simultaneously create the illusion of choice while also closing avenues of possible action' (Shove & Southerton, 2000, p. 315). Within these imposed regimes of use, the consumer is forced to make their own meaning within an order they often can not escape. This 'making do' establishes a degree of plurality within the imposed order – authorised narratives of use are riddled with the heterogenous stories of everyday consumer practices. These stories are 'not simple narrations in the standard linguistic sense of the term' (Law, 2000, p. 2), they do not simply represent reality but 'perform themselves into the material world ... in the form of social relations, but also in the form of machines, architectural arrangements, bodies, and all the rest' (Law, 2000, p. 2).

Although the normalisation of objects within society depends on the consistency and repeatability of these stories, it is also vital that the object continues to make sense through changing social conditions, and this depends on the consumer's ability to form meaningful connections through stories of use – the domestic freezer was seen to maintain its relevance through a repeated reinvention of its purpose. An object's 'normalization', its sustained sense of belonging within society, is therefore dependent not only on the emergence of a stable narrative but on its 'chameleon-like' ability to become something other. The object, repeatedly sketched and re-sketched through stories of use, maintains its social relevance by remaining open as a site of cultural production. The perception of stability therefore depends on the object's potential for reinvention.

2.5 The politics of use

If objects may be conceived as sites of cultural production then these sites are not without specific topologies that facilitate certain actions and limit others. The various ways in which an object remains open to reinvention reflect the conditions of consumption that surround and permeate the object. This relationship between consumer action and the field of forces in which the consumer finds themselves articulates the complex site of consumer agency. As Michel de Certeau makes clear in *The Practice of Everyday Life*, 'the tactics of consumption, the ingenious ways in which the weak make use of the strong ... lend a political dimension to everyday practices' (de Certeau, 1984, p. xvii).

Central to de Certeau's argument is a division between practices of production and consumption. Conceived as dialectic forces, 'production (capital and its functionaries) is unquestionably the dominant while consumption ("the people") is subordinate' (Lee, 2000, p. xvii). De Certeau disrupts the traditional distinction made between domains of work and leisure by drawing the producer-consumer division not through places of engagement but through 'modalities of action' (de Certeau, 1984, p. 29). These modalities are conceived as 'strategies' deployed by institutions of power and 'tactics' applied through acts of consumption. What distinguishes these two modes of action 'concerns the types of operations and the role of spaces: strategies are able to produce, tabulate, and impose these spaces, when operations

take place, whereas tactics can only use, manipulate, and divert these spaces' (de Certeau, 1984, p. 30).

By providing a distinction between production and consumption that is not derived from zones of operation (from places of work or leisure), de Certeau allows for a radical repositioning of the object. Rather than conceive of the object as an entity that moves from a zone of production into one of consumption, it may be understood instead as a site through which strategies and tactics perform themselves into the material world. As such, the object never leaves a 'zone of production'; instead it remains open to forces of production (to strategies of control) even as it sits within the consumer's hands. The object thus becomes a site of struggle, with producers seeking to position their goods in line with commercial strategies and consumers attempting to engage the object – to use it – in a personally and socially relevant way. Within the object, 'a rationalized, expansionist, centralized, spectacular and clamorous production is confronted by an entirely different kind of production, called "consumption"' (de Certeau, 1984, p. 31).

2.6 Conclusion

Through this chapter the object has been conceived as both a shifting field of relations and a site of cultural production. In establishing the object as a dynamic field we can see the object remains open to multiple, divergent manifestations that effect its meaning and functionality. This dynamism is achieved not at the expense of a stable object identity, but in the recognition that such stability arises from the repeated articulation of the object within a social sphere. Object stability is therefore intimately connected to our ability to rethink and remake objects in new and socially relevant ways.

In the following chapter the research will turn its attention to the physical remaking of objects. Starting with the premise that function acts as a stabilising influence, chapter three engages object failure as a disruptive force that dislodges objects from their normalised positions within society. Through the remaking of 'failed' objects, the research explores the practice of object modification, reflecting on the modification experience and developing a schema for understanding modification practices in general.



3. Remaking Things

3.1 Introduction

This chapter discusses my initial investigations into the remaking of objects. Couched within a public art event called FIX, these investigations were designed to give a basic overview of object modification and to highlight common themes within the field. Through the following text these themes are developed into a general schema for interrogating practices of object modification. Emphasis is given to the process-driven nature of these practices and the complex field of relations through which they operate. Alongside these developments a secondary concern arises: that of the role of the researcher and the nature of the space produced by the research. This concern reflects larger social issues regarding consumer agency and authorised modes of consumption. The chapter concludes with a discussion of the modification experience from the point of view of the modifier. The nature of this experience is explored through a distinction between ‘objects’ and ‘things’.

3.2 FIX

In 2004, while this research project was still in its infancy, Melbourne-based artist Spiros Panigirakas invited me to participate in an exhibition entitled ‘There’s a hole in the bucket’. By way of a complex organisational structure, Panigirakas co-ordinated five primary artists and 27 supporting artists into a group exhibition that questioned curatorial control, authorship, and artistic agency. Each of the five

[Figure 3-1 – *facing page*]
Planet Lamp parabolic microphone,
2005.
Image is author’s own.



[Figure 3-2]
FIX counter, 2004.
Image is author's own.

primary artists was assigned a character from the children's rhyme 'There's a hole in the bucket'. These characters were: Henry, Eliza, Failure, Fix and the Bucket. Panigirakas assigned me the role of Fix. Within Panigirakas's structured curatorial approach an opportunity arose for exploring the modification of everyday objects, providing a framework through which objects could be collected and re-

made. The *FIX* project emerged as a 'repair centre' for a material and social investigation into the remaking of objects.

1/ Each primary artist was teamed with five or six supporting artists. The term 'working bee' was used by Spiros to refer to these groups of supporting artists. The *FIX* working bee consisted of Carly Fisher, Jophes Fleming, Starlie Giekie, Susan Jacobs and Marcus Keating.

FIX established a service counter within the exhibition space, staffed by the *FIX* 'working bee'.¹ The *FIX* team (myself and the working bee) accepted 'problems' from exhibition visitors and attempted to 'fix' these problems. I promoted *FIX* as having expertise in 'all aspects of problem solving and repairs: mechanical, technological, personal, inter-personal, material'. People leaving objects for repair were required to sign a submission form, giving the *FIX* team the authority to perform modifications to the items as they saw fit. Members of the working bee were encouraged to think of 'fixing' as broadly as possible, with emphasis placed on the modification of the object rather than its restoration to some original condition.

2/ Each member of the *FIX* working bee was given a cap with 'FIX' embroidered on the front. The team was asked to wear these caps while staffing the repair centre.

Through the masquerade of a 'repair centre', with counter, signage, service bell, uniformed staff,² and consent forms reproduced in carbon copy, *FIX* provided participants with a familiar structure and a pre-scripted role. Participants performed the act of having something repaired while being fully aware that this was not an ordinary repair centre. The highly structured nature of this interaction helped produce a space where something unknown could take place, where participants could consciously give up control of their possessions, allowing

these possessions and their relationships with them to change.

The FIX project positioned object failure as an excuse, an alibi, by which objects could break from their established roles and be remade or re-contextualised as something else. In this regard, failure releases objects and their owners from a contract of use. ‘Freed from their reason to exist’ (Brandes, Stich, & Wender, 2009, p. 131), these objects offer themselves as an opportunity. Failure is not limited to material faults or reducible to a logic internal to the object. Objects fail when they cease to satisfy a specific need and therefore failure is defined not by the object alone but by a particular subject-object relationship (or, more precisely, by a set of relations from which a subject and an object may be construed). This subjective aspect of failure was evident in the FIX project with numerous objects described by participants as ‘aesthetically faulty’. These objects, although functional in a mechanistic sense, had fallen out of use due to a perceived inappropriateness or ugliness.

As an initial enquiry into the remaking of objects, the public nature of the FIX project offered a number of benefits over a more isolated approach. Of primary concern was that the selection of objects for modification be removed from my control; having members of the public bring in their ‘problems’ introduced a degree of randomness into the selection process, forcing the research in to directions that may not have been explored if object selection had been left to my own discretion. As a result of this relinquishing of control, the research was also exposed to a variety of social relations, given both through the socially constituted nature of the object and the specific object-owner dynamic, which would otherwise have been absent from the investigation. The randomisation of object selection provided a random selection of social domains (albeit social domains given within a largely white, middle class, western, contemporary-art-going public³). A third aspect of this public approach, and one that was to become a dominant theme within the research, was the engagement with audience – the public nature of the project made the research an explicitly performative act. Within the context of FIX this performance was deployed in order to



[Figure 3-3]
FIX submission form, 2004.
Image is author's own.

3/ Within this narrow demographic diversity was present in sexual identity and age.

produce a space of engagement. Alongside this production, however, sits a secondary production – one in which the research acts as a stage for performing my own individuality. That is, as much as FIX produced a space of engagement and a collection of modified objects, it also produced ‘Scott Mitchell’ as researcher and object modifier.

When FIX established itself as a repair centre within the exhibition it rendered an existing artist-audience relation as one of service provider and client. The FIX team, and myself in particular, were positioned as ‘experts’ within a specific field of operation. The authority to perform such a manoeuvre, to define a field of operation and claim it as one’s own, is granted through the binary division that produces artist–audience or producer–consumer as two separate domains. This division, maintained through an uneven distribution of power (which is also an uneven distribution of capital – in FIX’s case, embodied cultural capital (Bourdieu, 1986)), renders the primary term (artist – producer) as active and linked to notions of professionalism. By contrast the secondary term (audience – consumer) is rendered passive – lacking the skill, knowledge, equipment or time required for action. To be clear, this is foremost an act of positioning, a structural relationship that does not necessarily reflect a subject’s skill, knowledge or time, but instead speaks of a dominant entity’s ability to ‘create places in conformity with abstract models’ (de Certeau, 1984, p. 29) and impose these places on others.

The FIX project, operating from a position of power, created a space for engaging with object modification through the exclusion and control of the audience. This relationship rendered my position within the project as active and positioned the public as passive. While I experienced the project as a transformative and empowering journey, FIX was unlikely to have the same effect for the public participants. It was not until later in the PhD research that the inequality of this relationship presented itself as a problem. Future projects, particularly the iPod Social Outreach Program discussed in chapter six, attempt to produce a more complex relationship between producer and consumer – one that actively challenges this binary division of roles and promotes individual and collective agency. For the time being, however, FIX was ignorant of its subjugating nature and focused instead on the active remaking of objects.

4/ Quotes indicate descriptions given by the owners on the FIX submission form.

Over the duration of the exhibition FIX took a total of thirty requests. Many of these requests were not object related, involving instead a perceived socio-cultural ‘problem’. Of the requests involving objects, three proved to be particularly helpful for reflecting on the modification process. These three requests concerned: a ‘broken’ matchbox car, an ‘aesthetically faulty’ IKEA footstool and an ‘ugly’ desk lamp.⁴ Each of these objects was modified by myself. The following text gives a brief outline of the modification process.

The Matchbox car, described by its owner as a toy pizza van with broken suspension, was of a familiar cast metal and plastic construction. The short piece of wire forming the van’s front axle was bent, causing the front wheels to recede inside the van’s metal shell. The owner was a young child and this fact, coupled with the straightforward mechanical nature of the fault, prompted a straightforward response – I repaired the front axle. Having made this simple repair however, there remained a desire to intervene in the object to a greater extent. This desire stemmed from a need to fulfil the FIX objective to modify rather than simply repair the object, but there was also a desire to improve the object, to make it ‘better’ in some way before returning it to its owner. I decided to make it a ‘better’ car by following the logic of car customisation; in essence, I decided to ‘do it up’.

Drawing on established traditions within car enthusiast groups I made a number of aesthetic alterations to the model van: the windows were tinted, the rear suspension was jacked up and large rear wheels installed, rear wheel arches were added and a new paint job applied. Although the Matchbox car was returned to its owner in a significantly altered condition, it had not moved beyond its identity as a car – in fact its remaking consisted of a heightened engagement with the object as a car. A degree of comedy entered the endeavour here, for clearly the object is not a ‘real’ car, it’s a representation of a car, a child’s



[Figure 3-4 – top]

Matchbox car before remaking, 2004.

[Figure 3-5 – bottom]

Matchbox car after remaking, 2004.

Images are author’s own.



[Figure 3-6 – top]
IKEA footstool before remaking, 2004.
[Figure 3-7 – bottom]
IKEA footstool after remaking, 2004.
Images are author's own.

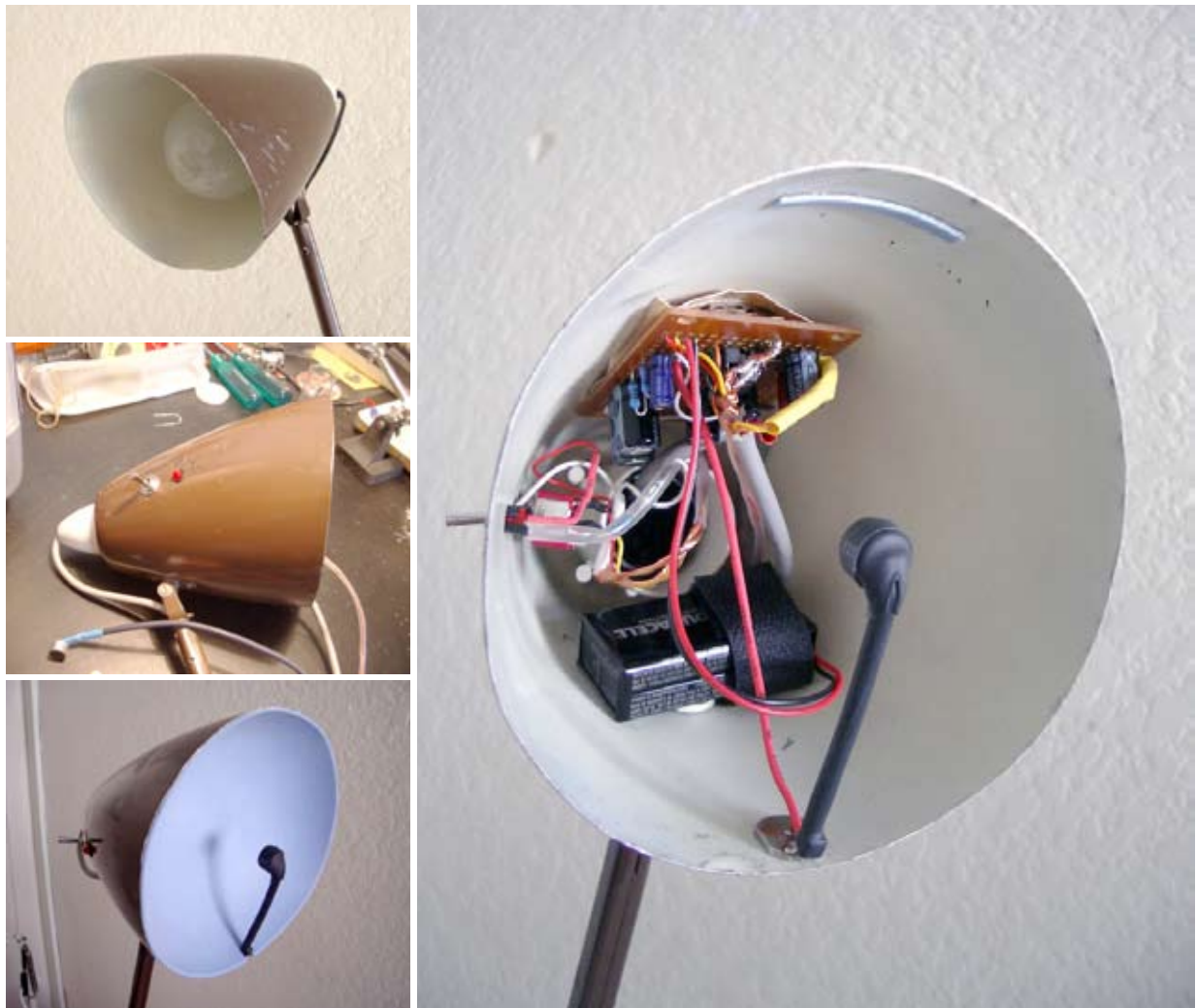
5/ Designed by W.P. (Bill) Iggulden in 1962 for the Melbourne-based firm Planet Lighting, this lamp was originally sold under the 'Studio K' name. It is now readily available in second-hand furniture stores, where, along with its floor-standing counterpart, it's commonly referred to as a 'planet lamp'.

toy. The modification of this object is therefore a displacement of car customisation practices from their traditional domain into a parallel field. The aesthetic qualities of car customisation remain recognisable, but their function has been transformed. They have become representational of a practice that happens elsewhere.

The IKEA footstool was submitted as 'aesthetically faulty'. I tended to agree with this assessment and quickly moved onto an exploration of what it may become. Due to its flat-pack heritage the footstool could be easily disassembled. The reducibility of it to its parts suggested the possibility of re-assembly in an alternative configuration. Through such thinking, the footstool became a material resource rather than a specific object. The process of re-assembly adopted the logic of a jigsaw puzzle, and with this the desire to use all available pieces and to limit the introduction of additional material. The object's reconfiguration as a low-slung chair does not strictly adhere to this program of

equivalence but does go some way towards satisfying the desire; two small pieces of wood were discarded and two metres of webbing and associated fasteners were incorporated into the design. The original footstool components remain clearly visible in the remade item, and the seat retains its IKEA heritage through being easily disassembled.

The 'ugly' lamp was, for me, the most difficult of the three objects to remake. There was no obvious tradition to follow, as with the Matchbox car, nor did the object disperse easily into an array of material resources, as with the IKEA footstool. My initial attempts to dislodge the object from its prescribed form and function involved dismantling the lamp and producing an inventory of its constituting parts. These parts, however, seemed too specific to offer alternative re-assembly, while their folded and cast metal construction made re-working difficult. Even more confounding than these material constraints was the culturally embedded nature of the lamp. I recognised the lamp as part



of Australia's design history: it was a table based 'planet lamp',⁵ and although it was showing signs of wear it was not, to my eyes, 'ugly'. My knowledge of this object was fixed within a personal and social narrative. Faced with this, the object's remaking seemed akin to an act of violence.

After much deliberation, I decided to turn the lamp into a parabolic microphone. The modification process involved removing the original wiring and globe fitting, and installing the microphone electronics and parabolic dish.⁶ The structure and basic appearance of the lamp was kept largely intact, a volume knob replaced the lamp's switch and a headphone socket was mounted in place of the power cord. The changes to the lampshade were more obvious. A light blue plastic dish (cut from a second-hand mixing bowl) served as the parabolic reflector while an on/off toggle switch was mounted to the side of the lampshade. An attempt was made to keep the microphone electron-

[Figure 3-8 – *top left*]
Planet Lamp before remaking, 2004.

[Figure 3-9 – *middle left*]
Fitting electronics to lamp, 2005.

[Figure 3-10– *bottom left*]
Planet Lamp after remaking, 2005.

[Figure 3-11– *right*]
Amplifier circuit installed, 2005.
Image is author's own.

6/ Microphone electronics were constructed from plans freely distributed on the Internet. For more information on the construction details see the research blog entry 'The Lamp – Parabolic Microphone', published 25/1/2005, <http://www.openobject.org/objectsinflux/?p=22>.



[Figure 3-12 – top]
Planet Lamp parabolic microphone
volume control, 2005.

[Figure 3-13 – bottom]
Planet Lamp parabolic microphone
headphone jack, 2005.
Images are author's own.

7/ The theme of occupation was continued in another modification project completed in April 2005 where a bat detector circuit was installed inside a 1968 Braun cigarette lighter designed by Dieter Rams. For details see Chapter 5: Telling Stories.

ics hidden within the lamp's frame; the bulk of this was housed behind the parabolic dish in the lampshade. The end result was an object that retained the form of the planet lamp while taking on the function of a parabolic microphone. A tension arises within this new configuration where the integrity of the original object is played off against its new functionality. The effect is akin to supernatural possession: the body of the lamp is occupied by an alien force, and the fact that the object now receives signals from distant sources seems to enhance this effect.⁷

The remaking of the Matchbox car, IKEA footstool and lamp present three distinct trajectories. These three paths traverse a field of material, cultural and personal relations, a nexus of connections concentrated in the object but not bound by it. The paths trace affordances given by the object but also, lines of flight away from the object. From a FIX perspective they resemble paths of least resistance, but this may not

hold true for all acts of modification – other practices may engage this field through struggle or conflict.

These three paths present a number of distinct themes. Changes to the Matchbox car were informed by shared narratives and social traditions. Such an approach presents a celebration of the object based in fetishization and excess. By contrast, the IKEA footstool modification casts the object as a material resource; the remaking is an act of reuse or recycling and as such may be associated with notions of frugalism. The third approach, the modification of the lamp, is more difficult to define. There is a randomness here, in the chance meeting of a desk lamp and a microphone, that suggests a level of humour and play. These themes may broadly be described as:

- traditional: a practice that follows a recognisable cultural tradition. Often found in community groups and 'sub-cultures' such as car

customisation practices.

- material: a practice that regards the object as a material resource that may be used to perform a specific set of functions. This approach is prevalent in ad hoc actions such as using a brick as a doorstep or an empty tin as a pencil holder.⁸
- playful: a practice that manipulates the object into unusual and surprising juxtapositions for comical and absurd effect.

The modification of an object is rarely a singular act; it generally involves multiple material operations undertaken over an extended period of time. As a consequence, modification projects often engage a number of different themes. For example, while car modifications generally follow an established tradition, they may also adopt a material approach and use whatever object is at hand to achieve a desired effect.⁹ Similarly, within the lamp modification a material mode of engagement is discernable in the use of a plastic mixing bowl for the parabolic reflector, and traditional engagement is present in the use of a popular amateur circuit design for the construction of the microphone electronics.

These themes indicate specific ways of operating within practices of modification, however they are not reducible to a set of instructions or procedures. Similar to de Certeau's 'ways of walking' the city (1984, p. 91), they may be regarded as a tactical manoeuvre, a way of negotiating an imposed order while retaining something of one's own desire. It should be noted, however, that an individual (the modifier) does not simply impose a way of operating on the practice. Instead, modes of operation are a condition of the practice's performance, and result from the meeting and negotiation of multiple forces within a complex field of relations. Therefore, we cannot assume a specific causal relation between individual intent and a mode of operation, for although we could argue that certain attitudes or intents encourage specific operations, it is equally possible that the reverse is true – that the repetition of a specific operation gives rise to particular attitudes or intents within the individual practitioner (Warde, 2005, p. 137).

Along with these various ways of operating it is possible to discern themes within the FIX project that describe the general conditions under which object modification takes place. Returning to the lamp

8/ Such practices are the focus of 'Design by Use: The Everyday Metamorphosis of Things' (Brandes et al., 2009).

9/ See, for example, the use of an old t-shirt in building a fibreglass speaker enclosure: <http://www.jeeppatriot.com/forum/showthread.php?t=17623> accessed January 31 2010. This technique, while initially a material-driven approach, has become a tradition within the DIY sub-woofer field.

project, we can begin by acknowledging the various conditions that contributed to its remaking as a parabolic microphone. These include:

- a discrete number of components and fittings
- a language of use that includes reflection, direction and spatial positioning
- cultural value established through historic narrative
- personal familiarity and appreciation.

These conditions both assist and limit the act of modification. The existing lamp components provided opportunities for the mounting of new hardware (specifically, locating the volume control and headphone jack) and the lamp's language of use effectively supported its new role as parabolic microphone. In contrast, the lamp's cultural value, coupled with my own personal appreciation for the lamp, served to block any significant alterations to the lamp's physical form. The above conditions may be abstracted into the following general categories:

- material constraints and affordances
- language of use
- cultural narrative
- personal history.

Taken together, these categories begin to define a field of relations specific to practices of object modification. As with the lamp modification, the features of this field may be rendered as either obstacles to be circumvented or, alternatively, opportunities that offer passage through the field. The specific topology of this field – the collection of obstacles and passages – will inform the various paths the modification process may take.¹⁰ The emergent quality of this path suggests a process-orientated practice determined through engagement within a field rather than the deployment of a strategy or plan. This is not to say that practices of object modification do not pursue goals, but rather that these goals are negotiated through the act of making. If this claim is true then the products of these practices – the stories, material artefacts, and the participants themselves – should present evidence of this negotiated, transformative journey; we may expect to find an adaptive, opportunistic practice that exhibits themes of exploration and invention.

10/ In interpreting practices of object modification through a 'field of relations' care must be taken not to position the individual as distinct from the field. The modifier does not simply trace a path within a field (as a figure walks a ground). Rather the individual constitutes (and is constituted by) the field; the path of modification arises from the field of relations rather than being inscribed in it from 'outside'. The modification process is both a function of the field and a transformation of it.

3.3 The modification experience

One area that has yet to be addressed by the research is the experience of producing a modified object; i.e. from the modifier's perspective, what actions or thoughts facilitate a shift in the object and what does it feel like to produce this shift? Such questions will, of course, present a diverse array of answers that reflect the numerous motivating factors and personal perspectives of the individual and the context. Within these diverse responses, however, it may be possible to find some common ground – a way of speaking generally about the act of modification that gives an adequate representation of its experiential qualities.

Two reflections on the FIX project may begin to answer these questions. The first concerns the feeling that remaking the lamp seemed akin to 'an act of violence'. What factors give rise to such a strong feeling? To begin, we can acknowledge a degree of anthropomorphism in our interaction with objects (Caporael, 1986). With anthropomorphism comes a concern for the 'body' – a tension between inside and outside, an aversion to puncturing the 'skin' of the object, increased awareness of the object's orientation, a mapping of features – arms, legs, eyes, mouth, ears, anus – onto the object, and a concern for the object's physical and mental 'wellbeing'. This tendency to anthropomorphise objects gives rise to a sense that any intervention in the object's 'natural' way of being is equivalent to an assault on a living entity.

In addition to this anthropomorphic tendency is the object's position within a social field which precipitates a degree of resistance to its reconfiguration. My appreciation of the lamp's cultural heritage and aesthetic qualities meant that I was reluctant to make significant changes to the lamp. This reluctance may be described through Bourdieu's notion of cultural capital (1986). The lamp can be understood as objectified cultural capital: something rare and worthy of being sought after, legitimised through a specific field of social relations. Additionally, my ability to recognise the lamp's cultural value is itself a form of cultural capital. In modifying the lamp I risk destroying both its objectified cultural capital and my own embodied cultural capital. It is perhaps this last point, the risk of losing

embodied cultural capital, which presents the greatest obstacle to the modification process. In common language, this is the risk of looking like a fool. The significance of this loss of cultural capital will depend on the strength of the legitimising social field and the individual's standing in relation to this field. In general, the greater the object's perceived cultural capital, the more resistive it will be to acts of modification.

The second reflection on the FIX project concerns a recognizable desire within the acts of modification to preserve a sense of the original object. Through each of the FIX modifications something of the original object is actively maintained: the Matchbox car modification enhances the object's identity as a car, the IKEA footstool represents the original object as a specific number of discrete parts, the lamp modification maintains an aesthetic and functional language that pays homage to the lamp's heritage. In each case the modification process reanimates a specific aspect of the original object as it reconfigures that object. Of course, by their very nature, modified objects always possess traces of their original form. What makes these traces significant in the FIX project is that they are deliberately foregrounded; the modification process privileges continuity, taking it as the logic by which the practice operates. This process of reanimating aspects of the object could be understood as a panacea to the violence of modification. Feelings of violence are alleviated because the modification appears to make a strange kind of sense in relation to the object's original condition.

In light of these reflections, we can say that the modifier is faced with a degree of resistance during the act of modification – the object, as a social construct, is both a source of this resistance and a means by which it may be overcome. Object modification could therefore be described as a process of rethinking the object from within, of finding in the object a path by which it may become something other. In seeking to understand how this may be done – how the object can be used to move beyond itself – we can look to a distinction between objects and things.¹¹

3.4 Objects and things

In speaking of 'things', literary theorist Bill Brown states that 'the

11/ As noted by Michael J. Madison (2005 footnote 2), a number of writers have recently turned their attention toward 'things'. See, for example, *Material Cultures: Why some things matter* (Miller, 1998), *How to do Things with Things* (B. Brown, 1998), *Thing Theory* (Bill Brown, 2001), *Things* (Bill Brown, 2004), *How are things? a philosophical experiment* (Droit, 2005).

word designates the concrete yet ambiguous within the everyday' (2001, p. 4). The term 'thing' is generally called into service when conventional references fail us – when proper names or common nouns are found to be either too general or too specific. But within our use of the term Brown sees an 'audacious ambiguity', for as much as the term seeks to 'name the object just as it is', "'things'" is a word that tends, especially at its most banal, to index a certain limit or liminality, to hover over the threshold between the nameable and unnameable, the figurable and unfigurable, the identifiable and unidentifiable' (2001, p. 5). It is this ability to locate the object at a 'threshold' of uncertainty that makes the term 'thing' so relevant to practices of modification.

Brown goes on to describe things as, firstly, 'the amorphousness out of which objects are materialized by the (ap)perceiving subject', and secondly, 'as what is excessive in objects, as what exceeds their mere materialization as objects or their mere utilization as objects – their force as a sensuous presence or as a metaphysical presence, the magic by which objects become values, fetishes, idols, and totems' (2001, p. 5). By reducing (or elevating) an object to the status of a thing, we set the object adrift from its normalised position in society, opening the object to divergent material and social possibilities.

Brown claims that:

'...producing a thing – effecting thingness – depends... on a fetishistic overvaluation or misappropriation, on an irregular if not unreasonable reobjectification of the object that dislodges it from the circuits through which it is what it typically is. Thingness is precipitated as a kind of misuse value. By misuse value I mean to name the aspects of an object – sensuous, aesthetic, semiotic – that become legible, audible, palpable when the object is experienced in whatever time it takes (in whatever time it is) for an object to become another.' (1999, p. 2)

Here 'thingness' is seen to arise from a heightened or deviant engagement with the object. Although producing a thing does not require a physical remaking of the object, it is clear that practices of object modification fit within Brown's description of object 'misuse'. By linking modification practices to notions of 'thingness' we can begin to understand how objects may facilitate their own divergent reconfig-

uration. The experience of object modification is given in this destabilising movement from object to thing.

3.5 Conclusion

The FIX project produced a rarefied environment for the modification of objects, a 'professional' domain deployed through 'artistic acts' and 'academic research'. Practices of object modification are, however, clearly not limited to such domains: everyday life is teeming with examples of object misuse, of 'fetishistic overvaluation and misappropriation'. It is interesting to note that, although I didn't realise at the time, each of the FIX modifications presented here – the Matchbox car, IKEA footstool, and lamp – has a likeness in contemporary consumer practices.¹²

The research will now turn its attention to these diverse activities, establishing a broad overview of practices of object modification and finding historical precedents for current trends within these practices.

12/ Similar practices to the Matchbox car modification can be found on the Diecast Car Collectors Zone website, <http://gallery.diecast.org/Custom-Diecast> accessed 2 July 2010. Extensive examples of IKEA furniture modification can be found on the IKEA hacker blog, <http://ikeahacker.blogspot.com/> accessed 2 July 2010. The lamp modification has its likeness in the 'hacking' and 'modding' of consumer goods, practices that take existing products and introduce alternative electronic components with new functionality.



4. Hacking, Modding and DIY

4.1 Introduction

Tim Hirzel owns a ‘Silvia’ espresso machine, a single-boiler model designed by Italian company Rancilio for domestic use. Tim’s machine differs from the standard Silvia model; he’s made some modifications. In 2004 Tim installed a PID (proportional-integral-derivative) control system based on a PIC microcontroller.¹ This microcontroller monitors the machine’s boiler temperature, sets the espresso and steam temperature points, adjusts the heater PWM (pulse width modulation) period, monitors temperature stability and acts as a shot timer. Information from the control system is displayed on a 20-character VFD (vacuum fluorescent display) and the various functions are calibrated using a modified 1980s NES (Nintendo Entertainment System) game controller. The PID control system keeps the machine’s temperature within 0.5 degrees of the ‘setpoint’.² Tim also added a drainage pipe to the drip tray, replaced the Silvia’s metal top with a clear Perspex panel, and installed cold cathode lighting beside the group head. In 2008 Tim upgraded the PIC with an Arduino microcontroller, and, added a real-time clock, sleep timer, wake-up alarm and water-level meter. The NES game controller was also replaced with a Nintendo Wii Nunchuk controller, and Tim made a video about the project, a ‘girl meets boy’ (Silvia meets Arduino) parody (Hirzel, 2006). This video, along with detailed build information, software code, reference material and critical reflections, is posted on the Internet and hyper-linked to numerous parallel practices.

1/ A proportional-integral-derivative controller is a control-loop feedback mechanism that is widely used in industrial control systems.

2/ Setpoint is a term used in control systems to refer to a target value. In this case the setpoint specifies the desired water temperature.

[Figure 4-1 – facing page]
Tim Hirzel’s modified Silvia coffee machine, 2006.
Photograph Hirzel.



[Figure 4-2]
Tim Hirzel's Silvia coffee machine with
Arduino controller, 2008.
Photograph Hirzel.

Tim's coffee machine is no longer the basic product he purchased seven years ago. Tim has remade the machine's internal functioning, user interface and aesthetics – even its advertising narrative. He has also remade his role as 'owner', 'user' and 'consumer'. Tim has gained possession of the object in a way that far exceeds the generic forms of 'ownership' and 'use' given with mass-produced consumer

culture. The coffee machine has become a site of innovation, an arena through which Tim can extend his technical prowess and participate in communal discourse.

3/ <http://www.arduino.cc/playground/Main/CoffeeTronics> accessed 12 February 2010.

4/ <http://www.diyhappy.com/nesc-controller-cellphone-mod/> accessed 15 February 2010.

5/ Figure A: 'Pokia' handset completed 20 February 2005. UK designer Nicolas Roope coined the term 'Pokia' to describe a traditional telephone handset connected to a mobile phone. Roope went on to market this product under the name Hulger, however the Pokia term persists within the DIY community where individuals create their own versions. See for example Robert M. Hall's home-made Pokia, <http://www.>

Tim's actions, remarkable as they may be, are not isolated. His website links to an online community where numerous other coffee related modifications can be found.³ In this network, individuals share their stories, offer advice and build collective knowledge. Such acts of modification and related activity are not limited to coffee machines: similar practices are visible in the 'use' of mobile phones (see, for instance: NES controller mobile phone,⁴ Pokia mobile handset,⁵ SMS your VCR⁶), iPods (iPodLinux,⁷ Rockbox⁸), power tools (power tool drag racing⁹) and even vacuum cleaners (Roomba¹⁰). Collected under the terms 'hacking', 'modding' and 'DIY', these practices of consumer modification present a diverse array of productive activity the scale of which has only recently become apparent.

This chapter investigates the extent of these activities and their representation within society via an exploration of the terms 'hacking', 'modding' and 'DIY'. Through examining the emergence and use of these terms a general overview of practices of object modification is developed. This overview reveals a number of common themes that describe a highly social and transformative consumer practice.

4.2 Hacking

Use of the terms ‘hack’ and ‘hacking’ emerged in the 1960s and 70s within the computer labs of MIT (Massachusetts Institute of Technology), Caltech (California Institute of Technology) and similar USA universities (Levy, 1984; Stallman, 2002). From the outset the term was used to describe a diverse array of practices ranging from the production of quick and crude software patches, to devising and

executing elaborate practical jokes. Richard Stallman, ex-MIT student and founder of the Free Software Foundation, describes hacking as an exploration of ‘the limits of what is possible, in a spirit of playful cleverness’ (2002), while Eric Steven Raymond, editor of *The Jargon File* (2004) and *The New Hacker’s Dictionary* (1996), defines ‘hackers’ as people with ‘technical adeptness and a delight in solving problems and overcoming limits’, citing firstly, ‘expert programmers and network wizards’ that ‘built the Internet’, and secondly, ‘people who apply the hacker attitude to other things, like electronics or music... [and] at the highest levels of any science or art’ (2001).

Prominent members of the hacker community, including Raymond and Stallman, criticise the popular media for using the term ‘hacker’ to describe ‘people (mainly adolescent males) who get a kick out of breaking into computers and phreaking the phone system’, preferring instead the term ‘cracker’ to describe such people (Raymond, 2001). The basic difference, according to Raymond, is that ‘hackers build things, crackers break them’. Despite their objections, however, many examples of hacking given by Raymond and Stallman involve the circumvention or alteration of conventional behaviour through acts that are often deliberately disruptive and anti-authoritarian. As Levy documents in *Hackers: Heroes of the Computer Revolution* (2001),



[Figure 4-3]

Pokia handset, 2005.

Image is author’s own.

impossibilities.com/v4/2004/09/21/heavy-duty-payphone-style-pokia-handset/ accessed 12 February 2010.

6/ <http://www.frisnit.com/sms/> accessed 12 February 2010.

7/ iPodLinux is the name adopted by a community of software developers working to port the Linux operating system to the iPod. <http://ipodlinux.org/> accessed 12 February 2010.

8/ RockBox is open source firmware developed for various MP3 players including the Apple iPod and iriver, <http://www.rockbox.org/> accessed 12 February 2010.

9/ Power tool drag racing is a competitive sport in which participants race modified consumer power tools (often belt sanders), <http://www.powertool-dragraces.com/> accessed 12 February 2010; see also 'SCREEN GRAB, A Sport for Purists: Belt-Sander Races' (Pollak, 2000).

10/ Vacuum cleaner modifications are often centred around robotic vacuum cleaners such as the Roomba from iRobot Corp (Robischon, 2007).

11/ Public meetings range from the industry led Black Hat conference to the community organised DEF CON convention, <http://www.blackhat.com/index.html> accessed 14 March 2010; <http://www.defcon.org/> accessed 14 March 2010.

12/ Similar efforts by prominent figures in the American hot-rod community sought to distance car customisation from the socially maligned illegal street racing (Lucsko, 1998).

hackers at MIT persistently challenged university systems, particularly when these systems were designed to prevent access to information or equipment: 'to a hacker, a closed door is an insult, and a locked door is an outrage. Just as information should be clearly and elegantly transported within a computer, and just as software should be freely disseminated, hackers believed people should be allowed access to files or tools which might promote the hacker quest to find out and improve the way the world works. When a hacker needed something to help him create, explore, or fix, he did not bother with such ridiculous concepts as property rights' (1984).

From this account it is clear that 'hacking' and 'cracking' share similar processes, if not a common ethical framework. Further complicating matters, the 'adolescent males' whom Raymond seeks to define as 'crackers' typically use the terms 'hacker' and 'hacking' to describe who they are and what they do. In addition, the practice of cracking/hacking is not solely the domain of adolescent males; it is a multi-faceted activity with prominent social and commercial dimensions. This diversity of practice is evident in the numerous public conventions organised around the cracking/hacking theme.¹¹

The distinction Raymond and Stallman endeavour to make between 'hacking' and 'cracking' can be seen as an attempt to distance hacking from the public hysteria that generally surrounds acts of computer trespass.¹² In discussing such hysteria Andrew Ross claims that hackers have been 'categorized as "enemies of the state" in order to help rationalize a general law-and-order clampdown on free and open information exchange' (2000, p. 254). Ross states that positioning hacking as a 'social menace' 'is central to the ongoing attempts to rewrite property law in order to contain the effects of the new information technologies that ... have transformed the way in which modern power is exercised and maintained' (2000, p. 254).

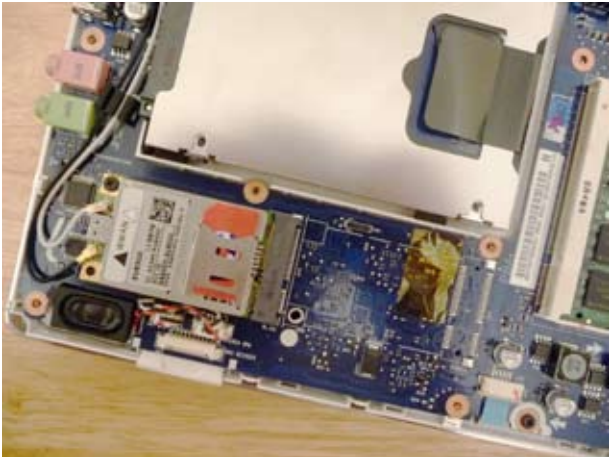
Ross's claims are particularly significant when we consider hacking's connection to the Free and Open Source Software (FOSS) movement. Although hacking pre-dates FOSS by more than a decade, these two practices are strongly intertwined. Raymond goes as far as stating that 'Today, "the hacker community" and "open-source developers" are two descriptions for what is essentially the same culture and popula-

tion' (2001). Within the FOSS movement, freedom is expressed as both freedom of the individual to act without censorship or outside control, and, freedom of information that privileges open dialogue and shared ownership. This attitude of openness forms an ethical underpinning for FOSS and hackers alike. As Raymond notes in his writing on 'how to be a hacker', hackers should resist 'artificial technical, legal, or institutional barriers (like closed-source code) that prevent a good solution from being re-used and force people to re-invent wheels' (2001). The Free Software Foundation's (FSF's) General Public Licence (GPL), developed by Stallman, has itself been described as a 'hack of the copyright system' in that it uses the copyright system to produce free and open resources rather than private property (Söderberg, 2008).

Firmly connected to hacking's conception of freedom is the notion of 'creative play'. Within playful acts we find a privileging of individual agency and the challenging of rules and boundaries. Likewise, hacking's focus on the circumvention of barriers is not motivated solely by a desire to access restricted information, but also by the challenge such barriers offer. Through playful engagement, hackers derive joy from exploring and testing the limits of their environments. Many MIT hackers were employed by the university to maintain and develop the university computer system and this playful approach often led to conflicts between the hackers and university administrators. As Levy notes, 'the [university] planners were concerned with applications using computers to go beyond computing, to create useful concepts and tools to benefit humanity. To the hackers, the system was an end in itself' (1984). The hackers' exploration of this system was driven by personal desire rather than administrative goals, and hackers did not confine their explorative activities to the computer system. The MIT hackers engaged a diverse array of domains, from ping-pong to campus security, applying the 'hacker attitude' to every aspect of their lives.¹³

Although resistant to the university's demands for 'real world' applications, MIT hackers were also at odds with the theoretical approach adopted by grad students within the artificial intelligence (AI) labs. Levy recounts how tensions developed between the 'official' research community and the hackers: 'the grad students viewed the hackers as necessary but juvenile technicians' and regarded hacking as 'unscientific', while hackers thought the grad students lacked real world expe-

13/ The expanded domain of hacking is particularly apparent in Stallman's account of 'hacking a use of 5 chopsticks' during a meal at a restaurant in Seoul (2002).



[Figure 4-4 – top left]

Samsung NC10 3G modem hack by João de Oliveira, 2009. Photograph Oliveira.

[Figure 4-5 – middle left]

GameBoy Drum Machine (solenoid) hack by Jowan Sebastian, 2008. Photograph Sebastian.

[Figure 4-6 – bottom left]

Circuit bending a 'Speak & Spell'. Photograph Pete Edwards.

[Figure 4-7 – top right]

iPod firmware (graphics) hack developed by IpodWizard, 2004. Photograph Phillip Torrone.

[Figure 4-8 – middle right]

Traffic sign hacked in Gainesville, Florida, U.S.A. Photograph Amelia Wilhelm.

[Figure 4-9 – bottom right]

IKEA bag raincoat by scasper. Photograph Stephanie Casper.

rience, ‘blindly theorizing about what the machine was like’ in theses that were of no real use (1984, p. 97). Where research students speculated about the future applications of computing, hackers were ‘living the future of computers’ (Fredkin, as quoted in Levy, 1984). Hackers saw themselves as explorers, as the ‘Advance Chopper to the System’, hacking the future into being (Levy, 1984). Operating outside both the pragmatic interests of the university administration and the ‘scientific’ research community, MIT hackers disrupted the traditional dichotic relationship between practice and theory.

Hacking’s disregard for the separation of theory and practice and its blurring of professional and private domains destabilise the objective, disinterested premise on which professionalism is founded. In light of this, Ross claims hacking has been designated ‘a strictly amateur practice’, where ‘the tension in hacking between interestedness and disinterestedness is different from, and deficient in relation to, the proper balance demanded by professionalism’. As such, hacking ‘serves as an example of professionalism gone wrong, if not very wrong’ (2000, p. 257). This irreconcilable relation to normalised academic practices and professional production frames hacking as a disruptive and deviant act. The failure of institutions (both academic and professional) to capture hacking, i.e. to give an adequate account of hacking’s productive potential, renders both the labour of hacking, and the products of this labour, largely invisible within the institutional order. In light of this, hacking practices are generally perceived as a threat to traditional property ownership, ‘normative educational ethics’ and the professionalisation of knowledge (Ross, 2000).

Within the field of object modification, ‘hack’ is generally used to describe a quick or unusual modification that challenges established modes of operation. Modifications are often centred on functionality where hacking typically adds to, or alters, the object’s original function. Examples of object hacking include: adding a 3G modem to portable devices,¹⁴ changing the iPod firmware to display custom graphics,¹⁵ using a GameBoy to trigger solenoids¹⁶ and altering the text on electronic road signs.¹⁷ A number of Internet sites focus specifically on object hacking. Generally taking the form of aggregator blogs, these sites present diverse arrays of modified objects. Prominent examples include Hack a Day and Hacked Gadget.¹⁸

14/ <http://bassoptumc.blogspot.com/2009/06/samsung-nc10-internal-3g-easy-mod.html> accessed 18 February 2010; <http://www.liliputing.com/2008/10/gigabyte-m912-hack-adding-an-internal-3g-modem.html> accessed 18 February 2010; <http://tnkgrl.wordpress.com/2008/10/28/modding-the-acer-aspire-one-hsdpa/> accessed 18 February 2010.

15/ <http://www.engadget.com/2004/12/08/how-to-hacking-the-ipod-firmware-changing-the-graphics/> accessed 18 February 2010. For more on iPod hacking see Chapter 6: Strategies of Control and Tactics of Use.

16/ <http://devel.8bitplateau.net/kbang> accessed 18 February 2010.

17/ Hackers of road signs often repeat similar slogans; popular text includes ‘ZOMBIES ARE COMING’, ‘RAPTORS AHEAD’, and ‘ALL YOUR BASE ARE BELONG TO US’, <http://www.signhacker.com> accessed 18 February 2010. Reports of electronic road sign hacks have appeared in numerous media channels (Byrnes and Voyles, 2009; Miller, 2009; Wert, 2009).

18/ Hacked Gadgets, <http://hacked-gadgets.com/> accessed 18 February 2010; Hack a Day, <http://hackaday.com/> accessed 18 February 2010.

19/ For examples of circuit-bent electronics see casper electronics, <http://casperelectronics.com/finished-pieces/speak-n-spell/> accessed 3 July 2010; 'What is Circuit Bending?', http://www.youtube.com/watch?v=w6Pbyg_kcEk accessed 3 July 2010; DIY electronics festival The Bent Festival, <http://bentfestival.org/> accessed 3 July 2010.

20/ <http://ikeahacker.blogspot.com/> accessed 22 February 2010. Statistics obtained via email correspondence with site administrator Jules.

21/ <http://ikeahacker.blogspot.com/search/label/accessories> accessed 17 March 2010.

22/ IKEA raincoat, <http://www.instructables.com/id/Make-an-Ikea-Raincoat/> accessed 17 March 2010; IKEA messenger bag, <http://ikeahacker.blogspot.com/2009/07/ikea-blue-shopping-bag-into-messenger.html> accessed 17 March 2010; IKEA snow boots, <http://ikeahacker.blogspot.com/2009/07/ikea-blue-shopping-bag-into-messenger.html> 17 March 2010; IKEA halter dress, <http://ikeahacker.blogspot.com/2010/01/ikea-blue-bag-halter-dress.html> accessed 17 March 2010.

23/ C'EST BON, <http://fangie2000.blogspot.com/2009/08/ikea-meat-balls-hack.html> accessed 17 March 2010.

Some forms of object hacking have developed into discrete practices with associated communities and traditions. One example of this is 'circuit bending', the act of creatively short-circuiting electronic devices to create musical or visual instruments. Typically carried out on low-voltage children's toys, circuit bending is, like hacking in general, an explorative process. Circuit benders interrupt or short the electronic device while it is operating, seeking to produce unusual audible or visual effects. When the resultant effect is deemed interesting, a switch or potentiometer may be added to the circuit to allow this effect to be repeated on demand. Circuit-bent devices are popular amongst electronic musicians and VJs.¹⁹

Although hacking often involves the modification of electronics and computer-related items, the term can also be found applied to practices outside this field. A prominent example of this is the modification of IKEA products. This practice has gained popularity through the IKEA hacker blog, which contains over 1,000 modified IKEA products from a similarly large number of contributors.²⁰ Initially focused on the re-configuration of IKEA furniture, projects have diversified to include modifications to IKEA crockery,²¹ IKEA shopping bags,²² and even the IKEA meatball recipe.²³

4.3 Modding

The term 'mod' (as discussed here) gained popular use in the 1980s and '90s within the personal computer and game console domains.²⁴ 'Mod' is typically understood to be an abbreviation of 'modification'.²⁵ In usage it is often synonymous with 'hack', however it was initially associated with three distinct practices: case mods, console mods and game mods. In each instance mod came to signify a specific style of modification carried out on a specific type of object (Sotamaa, 2005). In contemporary use 'mod' is used more widely, to name a diverse array of practices from body modification²⁶ to car customisation.²⁷ Within this diversity however, it is possible to identify persistent themes. The terms general use and its complex relation to commercial production prompts a detailed examination of its history.

Case modding

The activity of 'case modding' developed around the personal computer overclocking scene in the 1990s.²⁸ As participants within

this scene sought to increase the speeds of their personal computers through overclocking the system's processor, they were faced with the problem of heat dispersal – typically, the computer's original case could not adequately handle the excess heat being generated by the faster processor speeds. Overclockers resorted to cutting holes in their cases, installing additional fans, and re-routing internal cables to increase air flow. What emerged out of necessity quickly developed into a dedicated practice. Many overclockers chose to showcase their system modifications by installing transparent windows in the sides of the computer case and adding internal lighting effects. This early focus on cooling, internal cabling, case windows and lighting still dominates much of the case modding scene today.

The case modding community often refers to un-modified computer cases as 'beige boxes'. This term references a dominant trend among personal computers manufactured during the 1980s and '90s where computer cases were predominately beige in colour (often ranging from cream to a warm grey colour).²⁹ 'Beige box' is a derogatory term used to conjure up an image of blandness and conformity. Many computer case modders define their modding projects and general attitudes in opposition to this perceived blandness within the personal computer industry (Farivar, 2002). In this respect, case modding can be seen as an act of non-conformity motivated by a desire to distinguish one's own computer (and oneself) from generic mass-consumption. The recent appearance of the term 'grey box' parallels a shift in commercial PC styling toward a grey colour palette and indicates that case modders are reacting to the dominate style within the marketplace and not a particular choice of colour (jmke, 2004).

Case modders' opposition to the mass market has been complicated in recent years by the increased availability of off-the-shelf modding accessories and the introduction of 'windowed' cases by leading PC manufacturers. Modders discuss the implications of these developments on case modding forums and propose new structures for attributing value to their modding practices (Andreou, 2007). In an online forum post entitled 'Are people modding or accessorizing, silhouette comments:

'I always thought that modding does mean adding to the boring beige case to make it more interesting. But since in this day and age,

24/ Alternative meanings for the term 'mod' include the British subculture movement of the 1950s, a Gaelic festival dating back to 1892, and a mathematical operation. These meanings appear unrelated to the modding practices discussed here. More closely associated, although with no clear link to modding practices, is a notorious New York-based hacker group operating in the early 1990s under the name MOD, an acronym for, amongst other things, Masters of Deception, Masters of Destruction, and Millions of Dollars (Dibel, 1990).

25/ An early account of 'mod' being used to describe hardware modifications comes from the Popular Mechanics story in which Gregory Pope states 'mods' is 'NASA lingo' for hardware modifications (Pope, 1992).

26/ <http://www.bodymod.org/> accessed 24 February 2010.

27/ <http://www.mightycarmods.com/> accessed 24 February 2010.

28/ Overclocking is the practice of increasing the clock speed of a computer's microprocessor beyond the manufacturers specifications with the goal of increasing the computers performance. Overclocking may be carried out on a computer's central processing unit (CPU), graphics processing unit (GPU), random-access memory (RAM), or other motherboard chipsets.





[4-13]



[4-14]

Steampunk-themed case mods



[4-18]



[4-19]

LEGO-themed case mods



[4-23]



[4-24]

Toaster-themed case mods



[4-28]



[4-29]

'MacQuarium' reverse case mods

Figures – previous spread

First row:

[4-10] LCD monitor and computer keyboard mod by Sean Slattery (aka Jake von Slatt), 2007-2009. Photograph Slattery. <http://steampunkworkshop.com/lcd.shtml>, accessed 10 July, 2010.

[4-11] 'Steampunk Laptop' computer case mod by Richard Nagy (aka Datamancer), 2007. Photograph Nagy. <http://www.datamancer.net/steampunklaptop/steampunklaptop.htm>, accessed 10 July, 2010.

[4-12] 'Communicator PC' computer case mod by Cliff Wins (aka Maduncle), 2008-2009. Photograph Wins. <http://austeampunk.blogspot.com/2008/09/days-away-from-first-power-up.html>, accessed 11 July, 2010.

[4-13] 'Steampunk Frankenstein' computer case mod by Dana Mattock, 2006. Photograph Mattock. <http://www.flickr.com/photos/steampunkfrankenstein/sets/72157615106608643/with/3339974889/>, accessed 10 July, 2010.

[4-14] Mac Mini computer case mod by Dave Veloz, 2008. Photograph Veloz. <http://steampunkworkshop.com/daveveloz.shtml>, accessed 10 July, 2010.

Second row:

[4-15] LEGO hard drive case by Larry Page and Sergey Brin, 1996. This storage assembly, containing ten 4GB disk drives was used in the development of the Digital Library project, an early incarnation of Google. Photograph Gio Wiederhold. <http://infolab.stanford.edu/pub/voy/museum/pictures/display/0-4-Google.htm>, accessed 11 July, 2010.

[4-16] 'Big Blue' computer case mod by seb928, 2009. Photograph seb928. <http://www.brickshelf.com/cgi-bin/gallery.cgi?f=174449>, accessed 11 July, 2010.

[4-17] LEGO computer case mod by Kevin and James Deutsch, 2003. Photograph Kevin Deutsch. <http://legocomputer.com/>, accessed 11 July, 2010.

[4-18] 'Legobox' computer case mod by Todd Ripplinger, 2002. Photograph Ripplinger. <http://www.mini-itx.com/projects/legobox/>, accessed 11 July, 2010.

[4-19] 'LEGO Mac' computer case mod by Daniele Procida, 2003. Photograph Procida. <http://www.apple-juice.co.uk/pages/the-lego-mac.php>, accessed 11 July, 2010.

Third row:

[4-20] Toaster computer case mod by Adam Bertram, 2003. Photograph Procida. <http://www.toasterpc.com/>, accessed 11 July, 2010.

[4-21] Toaster computer case mod by Gordon L. Johnson, 2007. Photograph Johnson. http://www.leetupload.com/toaster_computer/, accessed 11 July, 2010.

[4-22] 'ToAsTOR' computer case mod by Joe Klingler, 2002. Photograph Klingler. <http://www.mini-itx.com/projects/toasterpc/>, accessed 11 July, 2010.

[4-23] 'Nintoaster II' Nintendo case mod by Richard DaLuz, 2009. Photograph DaLuz. <http://www.stupidfingers.com/projects/nintoaster2/>, accessed 11 July, 2010.

[4-24] 'Super Nintoaster' Super Nintendo case mod by Richard DaLuz, 2009. Photograph DaLuz. <http://www.stupidfingers.com/projects/snt/>, accessed 11 July, 2010.

Fourth row:

[4-25] 'MacQuarium' Apple Mac 128K computer case mod by Aleks Oniszcza, 2003. Photograph Oniszcza. <http://vividpicture.com/aleks/macquarium/>, accessed 11 July, 2010.

[4-26] 'Two-Page MacQuarium' Apple 21" monochrome monitor case mod by Greg T. Anderson, 1998. Photograph Anderson. <http://homepage.mac.com/torgo/MacQuarium/Pages/Two-Page%20MacQuarium.html>, accessed 11 July, 2010.

[4-27] 'MacQuarium' Apple 20" Studio Display case mod by Eric Chan, 2007. Photograph Chan. <http://picasaweb.google.com/erichan731/MacAquarium#>, accessed 11 July, 2010.

[4-28] 'Monster iMacQuarium' Apple iMac computer case mod by Andrew Moses, 2005. Photograph Moses. <http://imacquarium.cool-mac.com/index.html>, accessed 11 July, 2010.

[4-29] 'G4 CubeQuarium' Apple G4 Cube computer case mod by Joe and Carrie Ann, 2003. Photograph Joe. <http://home.comcast.net/~jleblanc77/cube/>, accessed 11 July, 2010.

29/ The trend for beige coloured computer equipment was established with the first widely successful personal computers. See, for example, the Apple II microcomputer released in 1977, IBM's first Personal Computer (model 5150, released in 1981) and Commodore International's Commodore 64 (released in 1982).

30/ <http://www.atomicmpc.com.au/forums.asp?s=2&c=18&t=833> accessed 14 February 2008.

31/ For a discussion on originality in case modding see atomic forum topic 'Originality: does it matter anymore?', 14 June 2003, <http://archive.atomicmpc.com.au/forums.asp?s=2&c=18&t=662>, accessed 3 July 2010.

32/ <http://www.datamancer.net/> accessed 3 July 2010.

33/ In privileging the unusual and unexpected, case modders may deliberately transgress case modding traditions. See for example the Mac-Windows PC hybrid case by Jared Bouck, <http://www.inventgeek.com/Projects/p4mac/p4mac.aspx> accessed 11 February 2010. Also prominent in the case modding scene are cardboard case mods. See for example Sigmund's case mod listed under 'Worst Cases' on the Mofo Cases site, http://www.mofocases.com/cases.php?case_id=18 accessed 15 February 2010. Rudimen-

*you can get bright cases and lots of bits an pieces to make it more "colourful", the definition of modding has changed.'*³⁰

In re-defining case modding, some modders call for a privileging of craftsmanship and the hand-made, while others emphasise originality and creativity.³¹ This desire for originality has resulted in increasingly unusual and complex case mods. Experienced modders often complete numerous case mods and develop a personal style that reveals itself in their material choices, production methods, and underlying themes. One example of this is the work of Richard R. Nagy, whose case mods mix computer technology with the aesthetic of Victorian-era mechanical devices.³² Specializations such as this can form subgroups within the case modding community and are often connect to broader social practices or subcultures. In the case of Nagy's practice, this style of case modding and the associated subculture has come to be know as 'Steampunk' (Ferla, 2008).

Along with recognisable subgroups, case modding presents a diverse array of reoccurring themes centred around (amongst other things) movie and computer games, aesthetic styles, construction materials, commercial brands and even specific household objects (figures 4.12-31). While some themes are antithetical in nature (for instance Apple Macintosh and Microsoft Windows themes are rarely combined) many mod projects engage with multiple themes.³³ The recurring nature of these themes constitutes a shared tradition within the case modding community.

Case modders often present their projects in the form of a 'build log' or 'mod guide' – a step-by-step story of the case modding project posted online on the modder's personal website or a community forum. Mod guides may consist of a number of individual posts that document the project's development as it unfolds through time, or a single post presenting the mod at the completion of the project. The level of detail given in a mod guide may also vary greatly. Basic mod guides may present a small number of photographs of the modding process and the finished mod, while detailed guides can spread over numerous web pages and include information from a broad range of sources including: inspiration and influences, discussion of materials used, construction tips and techniques, and personal

narratives.³⁴ Internet sites that host mod guides generally provide a mechanism for viewers to comment on the project. Viewer comments may express encouragement, praise, criticism and technical or aesthetic advice.

Although the majority of social interaction surrounding case modding is mediated through online forums and personal websites, some case modders also participate in 'real-world' meetings. Such meetings are generally arranged as auxiliary events to larger computer-focused functions such as LAN parties, trade conventions and computer swap meets.³⁵ Real world meetings may include modding competitions with prizes (generally donated by competition sponsors) for the best case mod.

Closely related to case modding is the act of re-tasking computer cases for use outside the computer domain. Sometimes referred to as 'reverse case modding', examples of this practice include the use of computer cases to construct bookshelves,³⁶ backpacks,³⁷ CD holders,³⁸ mailboxes³⁹ and hamster or mouse enclosures.⁴⁰ As with case modding, recurring themes are evident within the field of reverse case modding. One prevalent theme involves turning the computer case into an aquarium. Particularly popular amongst Apple Macintosh fans, this style of reverse case mod has been termed a 'MacQuarium'.⁴¹

Console modding

Console modding is the practice of modifying a computer game console to enable it to load and run unauthorised software. The practice of console modding emerged in response to various copy protection measures implemented by gaming console manufacturers. The nature of the copy protection measures vary from manufacturer to manufacturer, however they generally prevent the loading of copied or 'pirate' games, 'homebrew' software,⁴² alternative operating systems (such as GNU/Linux) and games from outside the players' geographical regions. Console modding attempts to circumvent these security restrictions by either modifying the game console's hardware through the application of 'modchips' (hard modding),⁴³ or modifying the console's software through the exploitation of loopholes and vulnerabilities in the consoles' system software (soft modding).

tary case mods such as this are the antithesis of traditional case modding practices. As g52ultra comments: 'this is so %&%\$! cool. This goes beyond getting a life. You're just flat ou[sic] thumbing your nose at not only modders but the BestBuy morons', http://www.mofocases.com/cases.php?case_id=18 accessed 15 February 2010.

34/ For an example of a highly detailed 'mod guide' see the BaDasumption case mod by dutchcedar, <http://www.wizdforums.co.uk/showthread.php?t=1758> accessed 6 June 2010. This forum thread has over 100 pages of detailed project description, build photos, 3D renders, links to materials and service providers, personal information, and a great deal of reader comment and advice.

35/ A LAN party is an event at which participants establish a Local Area Network between two or more personal computers, usually for the purpose of playing multiplayer computer games. Participants at LAN parties generally bring their own computers. Organisers of LAN parties often run case modding competitions. An example of this can be found on the Pittsburgh LAN Coalition website, <http://www.pittco.org/iron-storm-xi-case-mod-contest/> accessed 13 February 2010.

36/ <http://www.iol.ie/~thedeans/reversemod/> accessed 15 February 2010.

37/ <http://www.instructables.com/id/Macpack/> accessed 15 February 2010.

38/ For a CD holder case mod example see <http://www.biggrandejatte.co.uk/casemod/> accessed 15 February 2010.

39/ For a mailbox case mod example see <http://www.applefritter.com/node/18433> accessed 15 February 2010.

40/ <http://gucciandprada.blogspot.com/2006/11/house-that-we-built.html> accessed 16 February 2010, and <http://www.boingboing.net/2004/07/06/hamster-cage-case-mod.html> accessed 16 February 2010.

41/ Andy Ihnatko, a prominent computer journalist and Apple enthusiast, coined the term MacQuariums in 1992 when he wrote a humorous set of instructions for turning a Mac 512 into an aquarium (Ihnatko, 1992). For an extensive collection of MacQuariums see <http://www.theapplecollection.com/Collection/MacAquarium/index.shtml> accessed 15 February 2010.

42/ Homebrew software is software that has been wholly or partially developed by hobbyists for enjoyment rather than profit. Homebrew software often takes the form of modified game titles – see the Game modding section later in this chapter.

43/ Modchips are specially designed integrated circuits that, when wired to the game console's existing circuitry, bypass or disable the console's security measures. Modchips are generally tailored to suit the particular model of game console being modded. New console releases generally require the production of new modchips.

44/ USA anti-circumvention laws were exported to a number of countries through Free Trade Agreements. For details on the Australian-United States Free Trade Agreement see cnet article 'Trade deal exports DMCA down under' (McCullagh, 2004). The relevant section of the Australia-United States Free Trade Agreement may be found at http://www.dfat.gov.au/trade/negotiations/us_fta/final-text/chapter_17.html accessed 4 April 2010. Interpretation of DMCA legislation differs from country to country; see for example the UK ruling commented on in *New Scientist* (Fox, 2002).

45/ In 2005 the Australian High Court ruled in favor of modchip seller Eddy Stevens (High Court of Australia, 2005). Copyright law has since changed in Australia to bring it in line with the USA DMCA. A recent case, although settled out of court, saw a federal judge order Australian modchip distributor RSJ IT Solutions pay Nintendo \$520,000 in damages (Hall, 2010). In a UK ruling, Neil

The legality of developing, distributing and installing modchips is highly contested. With the introduction of the Digital Millennium Copyright Act (DMCA) in the USA in 1998, the circumvention of copyright protection measures and the distribution of information related to such activity became a prosecutable offence. Many countries, including Australia, have adopted similar legislation.⁴⁴ While game manufacturers have successfully prosecuted suppliers and installers of modchips in a number of countries, case rulings are far from consistent.⁴⁵ Due to console modding's questionable legal status it is often an underground activity, with consumers sourcing modchips through international Internet sites⁴⁶ and console modders offering their services through market stalls and private residences (QuickJump, 2007). Despite the legal and technical efforts of manufactures to prevent console modding, every major personal gaming console released in the past ten years has spawned an associated market for modchips and unauthorised software (racketboy, 2006).

Game modding

Game modding refers to the consumer modification of computer game graphics, sounds and/or game play. Although the practice of game modification can be seen to date back to the early 1970s,⁴⁷ the first widely recognised game mod occurred in 1983 with the production of 'Castle Smurfenstien' (Au, 2002). Based on the popular World War II-themed 'Castle Wolfenstein' (1981), the 'Castle Smurfenstien' mod replaced all the original game characters and text with smurfs and smurf-related items.⁴⁸ Such references to popular culture are common in game mods; further examples of this include a 1993 mod of first person shooter (FPS) game 'Doom' to include Barney, a singing, dancing, purple dinosaur,⁴⁹ and a 2003 mod of 'Battlefield 1942' called 'GI Joe' that introduced a number of game elements based on the 1980s animated television series and children's toy of the same name.⁵⁰

The practice of game modding is of significant economic value to the computer game industry. Game modding has been seen to develop brand recognition, increase customer loyalty, extend a game's shelf life and provide commercial game developers with what amounts to a low-cost yet highly innovative research and development environment (Kücklich, 2005). In light of these benefits, game developers

Stanley Higgs was convicted for the possession and sale of modchips, however this finding was dismissed on appeal (Sherwood, 2007; Smith, 2008). In contrast, U.K. modchip seller Christopher Gilham was unsuccessful on appeal (England and Wales Court of Appeal (Criminal Division), 2009). In Canada, recent rulings have been made in favour of console manufacturers (CBS News, 2002) (R. v. Garby, [2002] O.J. No. 3383).

46/ <http://www.mod-chip.com> accessed 11 Feb 2010.

47/ One of the earliest documented game mods was the modification of Will Crowthers' 1972 role playing game 'Adventure' by Stanford student Donald Woods (Hunter, 1998-2000; Kushner, 2002).

48/ Smurfs are small blue fictional creatures created by Belgian cartoonist Pierre Culliford and developed into an animated children's television series called 'The Smurfs' by Hanna-Barbera Productions in 1981.

49/ Barney the dinosaur is character from a long-running USA children's television show 'Barney & Friends'. The show has been widely criticised for being saccharine and one-dimensional; consequentially Barney the dinosaur is the target of numerous parodies (Au, 2002; Curtis, 2004; McNamara, 2005). Footage of the Barney mod can



[Figure 4-30 – top]

Title screen from *Castle Wolfenstein*, 1981.

[Figure 4-31 – bottom]

Title screen from 'Castle Smurfenstein', 1983.

Images from *The first 'Official' Castle Smurfenstein Home Page*,

<http://www.evl.uic.edu/aej/smurf.html>, accessed 8 July 2010.

have been quick to capitalize on the activities of game modding. With the release of 'Doom' in 1993, lead programmer John Carmack organized the software code so that players could easily introduce new sounds, graphics and levels without damaging the game's core (Kushner, 2002). Within weeks of 'Doom's' release players were not only modifying the game, but had also turned their attention to the game editor. Game players Raphael Quinet and Brendon Wyber created a DOS-based level editor called Doom Editing Utilities (DEU), which allowed players to build new game levels from the ground up (Doom Wiki, 2005; Kushner, 2002). Other user-produced game editors soon followed as game players re-defined themselves as game developers.

The collaborative relationship between game modders and the game industry has elicited

praise for its participatory nature, the privileging of consumer agency and the formation of gaming communities (Au, 2002; Kushner, 2002; Postigo, 2003). However, there is also criticism of game manufacturers' capitalization of the highly skilled, yet largely unpaid labour of their customers (Huhtamo, 1999; Kücklich, 2005; Postigo, 2003). Through the use of restrictive end user license agreements (EULAs) modders are often denied the chance to share in the profits of their labour. Kücklich claims 'modding's uncertain status in respect to traditional notions of work and leisure, the deprivation of modders of their intellectual property rights, the game industry's outsourcing of risk to the modding community and the ideological masking of modding as a collaborative process - make modding appear as a very precarious form of labour indeed' (2005, p. 6).

Despite claims of exploitation, game modding has expanded into a diverse array of practices. One rather unusual example of this is the modification of game demo screens to produce animated narratives.⁵¹ This activity constitutes a new form of cinema that has been termed 'machinima' (Bailey, 2007). Other game modding practices include

‘skinning’, the replacement of specific characters or objects within the game, and ‘total conversions’, the ambitious remodelling of game characters, environments, sounds and game play to produce a wholly new gaming experience. Total conversions are often collaborative efforts with teams of game modders working toward a common goal. Prominent total conversions such as ‘Counter-Strike’ (2000) and ‘Day of Defeat’ (2000), based on Valve Software’s FPS ‘Half-Life’ (1998), became widely popular with gamers and went on to receive commercial release.

4.4 DIY

The term ‘do-it-yourself’, and its acronym DIY, emerged amidst a century of sweeping social change that saw dramatic shifts in work patterns, a burgeoning of the middle classes and the rise of leisure as a distinct domain. Steven M. Gelber claims that increased separation of work and leisure at the end of the nineteenth century created a condition where ‘the ideology of the workplace infiltrated the home in the form of productive leisure’ (1999, p. 2). According to Gelber, the emergence of productive leisure within the domestic environment reinforced established gender spheres and resulted in increased demarcation of the home into male (the basement/garage) and female (the kitchen/garden) zones (1999, p. 2).⁵² However, as popular media from the time attests, do-it-yourself production was not a solely male domain. An article titled ‘Domestic Upholstery’ from an 1882 edition of *The Queenslander* states, ‘it is wonderful how much can be done at home by willing hands and clever brains’ and encourages women to ‘do it yourself’ when it comes to re-upholstering ‘ungainly old furniture’ (25 February, p. 234). While specific do-it-yourself activities may have maintained and reinforced gender divisions (male activities were generally associated with tools and machines, female activities with fabrics and yarns),⁵³ the do-it-yourself movement was active across genders. Australian newspaper advertisements from the early 20th century promote ‘do it yourself’ home renovation,⁵⁴ car maintenance,⁵⁵ shoe repair⁵⁶ and beauty products;⁵⁷ an advertisement from 1921 for a prominent Sydney department store proclaims ‘THE “DO IT YOURSELF” AGE’ and urges readers to knit their own sweaters (The Sydney Morning Herald, 18 May, p. 2).

be found on YouTube, http://www.youtube.com/user/ramenwarriorthe1s#p/a/u/0/M2tT78lq_-8 accessed 3 July 2010. For public criticism of Barney see ‘Why Children Hate Dinosaurs’ (Mitchell, 1998). For Barney parodies see ‘The source of all evil’ (Frankel, 2006). For legal controversy surrounding Barney parodies see ‘Purple, the Color of a Legal Connipion’ (Zeller, 2006).

50/ Shortly after the ‘GI Joe’ mod’s alpha release Hasbro, owner of the GI Joe brand, ordered development and distribution of the mod to be stopped, claiming infringement of intellectual property rights. For further details see Chapter 5: Telling Stories.

51/ See for example Red vs. Blue, an animated web serial based on the computer game ‘Halo’, <http://red-vsblue.com/home.php>, accessed 16 February 2010.

52/ Positioning the home as a site of leisure is a particularly masculine vision and one that is largely blind to extensive and enduring forms of domestic labour. Green, Hebron and Woodward give a lengthy account of the gendered nature of leisure in *Women’s leisure, what leisure?* (1990).

53/ Sally MacDonald and Julia Porter dispute this clear division in domestic roles, claiming couples often worked together on DIY projects (cited in Atkinson, 2006, p. 7).

54/ See for example advertisements for 'Wunderlich Metal Ceiling', *The Sydney Morning Herald*, 12 January 1907, p. 21, and 'New Era Paint' from Shaw and Sons, Limited, *The Brisbane Courier*, 15 January 1907, p. 1.

55/ See for example advertisements for: Bradley Bros., Limited car hood material (convertible roofs) for do-it-yourself installation, *The Sydney Morning Herald*, 2 December 1922, p. 7; Bulldog Grip self-vulcanising patch for car tire repair, *The Argus*, Melbourne, 21 October 1924, p. 16; Efficiency Motor Schools offering amateur courses in car repair and maintenance, *The Sydney Morning Herald*, 26 October 1928, p. 22.

56/ See for example 'Be Your Own Boot Repairer', advertisement for Charles Davis Ltd., *The Mercury*, Hobart, 11 August 1920, p. 8.

57/ See for example advertisements for: 'Instanta hair remover', *The Argus*, Melbourne, 19 May 1925, p. 14, and 'The New West Electric Hair Curler', *The Argus*, Melbourne, 21 November 1925, p. 37.

58/ Shifting relationships to service providers are highlighted in Gelber's comparison of the maintenance and renovation practices of American households from the 1860s and the post-war 1940s. Gelber finds that an average, middle-class American

Within the popular media, do-it-yourself activities were presented as both 'wholesome' leisure pursuits and economic necessities (Atkinson, 2006). Material shortages in 1942 saw Melbourne-based newspaper *The Argus* run a daily 'Do It Yourself' column giving instructions on (amongst other things) how to make your own mock-casins, how to frame photos, how to repair gates and how to make a trench pump (23 May – 26 June, p. 2). In 1953 an article on the growing number of 'evening and week-end home decorators' stated that 'the wave of Do-it-yourself rolls on: More and more women are demanding washing machines. In shoe repairs, stick-on soles and heels belong to the man of the house' (*The Sydney Morning Herald*, 11 June, p. 3s). Comments such as this, which equate DIY with domestic washing, shoe repair and home decoration, indicate changing relations between households and service providers and mark a struggle to name emergent forms of domestic labour.⁵⁸ The complex and ongoing changes in society, including new work and leisure patterns, general wage increases, growing home ownership and the introduction of domestic 'labour saving' technologies,⁵⁹ saw the do-it-yourself approach applied to all manner of professional and trade-based activities around the house.

Over the course of the 20th century, 'DIY' has come to reference a diverse field of practices. In the introduction to the *Journal of Design History's* special issue on DIY, 'Do It Yourself: Democracy and Design', Paul Atkinson describes DIY activities as ranging from 'handicrafts to home maintenance, interior decorating, interior design, garden design, vehicle maintenance and customization, home improvement and self-build homes' (2006, p. 2). To this already broad collection may be added music production (most notably punk and alternative/indie genres),⁶⁰ publishing (ranging in form from photocopied 'zines'⁶¹ to Internet blogs) and even culture in general (as articulated through protest and direct action groups) (McKay, 1998; Piano, 2003). Finding a common thread within these discordant practices is somewhat daunting; what, for example, does punk rock have in common with a bathroom renovation? This research adopts a relatively straightforward position: the term DIY and the practices collected under this banner are seen to articulate a distinction between amateur and professional production – i.e. you 'Do It Yourself' instead

of having it done for you. DIY therefore names a rich diversity of amateur production.

Of particular significance to this research are the various counterculture groups that, from the late 1960s onward, began to contextualise DIY as a political act. Holtzman, Hughes and van Meter recount how, as the economic and political climate in the West worsened and a general feeling of hopelessness spread through activist communities, DIY emerged as a way of empowering marginalized sectors of society and subverting capitalism (2007, p. 44). Rather than waiting for top-down, institutional reform, the counterculture movement sought to enact change within their own lives through direct action. The DIY ethos that emerged claimed ‘you can do for yourself the activities normally reserved for the realm of capitalist production’ and, through self-engagement, resist the alienation and nonparticipation inherent in consumer society (Holtzman, et al., 2007, p. 44).

Stewart Brand’s publication *The Whole Earth Catalog* (1968) played a pivotal role in the formation of North American DIY culture. Building on an established tradition of DIY leaflets, manuals, guidebooks, retail catalogues, and magazine articles, *The Whole Earth Catalog* presented a wide array of products, materials, book reviews, educational courses and construction drawings pertinent to the late ’60s alternative lifestyle. The publication became hugely popular within the North American counterculture movement and by 1971 *The Whole Earth Catalog* was 448 pages long and had sold more than a million copies (Turner, 2006). Through extensive use of reader contributions the publication blurred traditional hierarchies between publisher and reader. This open, communal approach to information gathering and sharing has seen *The Whole Earth Catalog* described as a pre-cursor to the World Wide Web and a major impetus behind notions of a ‘peer-to-peer ad-hocracy’ that have become prevalent throughout internet culture.⁶²

Another notable contribution to the development of DIY as a political force came from the punk and post-punk music scene of the late 1970s and ’80s.⁶³ Although often at odds with ‘hippie’ counterculture of the 1960s, the punk and post-punk movement adopted a similar political stance, including a rejection of mass-consumption, opposition to institutionalised authority, a challenging of property ownership and

household in the 1860s relied heavily on hired help for carrying out manual labour around the home; by the end of the 1950s, however, the ‘term “do-it-yourself” would become part of the definition of suburban husbanding’ (1997, p. 67).

59/ For a discussion on the impact of technology in the home and the ‘labour saving’ nature of this technology see Cowan (1983) and Oakley (1975). These studies conclude that while technological innovation in the home may reduce time spent on a particular household task, the overall time spent on housework – predominately undertaken by women – has remained relatively constant. In speaking of nineteenth-century technological developments Cowan states that ‘industrialization served to eliminate the work that men (and children) had once been assigned to do, while at the same time leaving the work of women untouched or even augmented’ (1983, p. 64).

60/ See Tim Gosling’s account of the Anarcho-Punk movement in the late 1970s and 80s (2004), Smith and Maughan’s account of the Manchester DIY music scene in the early 1990s (1997), and Ninan, Abraham and Oakley, Kate and Hearn, Gregory N. writing on the Australian DIY music scene (2004).

61/ A 'zine' or 'fanzine' is a small magazine-style publication with limited circulation, generally financed, printed (often on a black and white photocopier) and distributed by the author/editor (Duncombe, 1997; Triggs, 2006).

62/ A position advanced by Fred Turner in *From counterculture to cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (2006). Turner shows how Brand and the Whole Earth network developed connections between San Francisco's counterculture movement and key individuals within Silicon Valley's emerging technology hub, actively promoting a vision of the Internet as a transformative, democratising space.

63/ Triggs regards the punk music scene as the place where DIY became a recognisable subculture (2006).

64/ Mary Celeste Kearney cites *Rough Trade's* Geoff Travis as arguing that 'the independent DIY ethos thought by many to be a purely punk inspiration, actually came later in other forms of music; 'When we started our own record label... it wasn't punk but post-punk... and women's music: Kleenex, the Raincoats'' (1997, pp. 214-215).

the privileging of individual agency and self-determination. Active resistance, conceived through a DIY ethos (particularly within the post-punk movement),⁶⁴ shaped punk's relation to everything from music production, distribution and performance to fanzines, clothing, housing (squatting) and anarchist politics.

DIY attitudes found in punk and related subcultures became prominent in protest groups of the 1980s and '90s, particularly within the UK where the Anti-Poll Tax campaign in the late '80s and the road protest camps of the '90s saw the adoption of direct action and the DIY ethos as a means to influence social events (McKay, 1998, p. 6). In speaking of the similarities between DIY culture (understood through the lens of 1990s political activism) and counterculture movements of the 1960s, McKay cites 'a combination of inspiring action, narcissism, youthful arrogance, principle, ahistoricism, indulgence, creativity, plagiarism, as well as a rejection and embracing alike of technological innovation' (1998, p. 2). For many participants, the value of DIY culture 'lies not in "the effect" of long-term strategy to bring about political goals, but in itself as an act of non-compliance, an act of authenticity to one's own beliefs' (Corrine and Bee cited in McKay, 1998, p. 6).

For over a century DIY practices have 'enabled the consumer to rail against the prescribed design edicts and ... social mores of the time' (Atkinson, 2006, p. 9). Whether this be through a democratisation of luxury goods (Jackson, 2006) or the wholesale rejection of consumer culture, the political dimension to DIY suggests that practices may be arranged according to their transformative potential.⁶⁵ Such an arrangement presents a field of activity distributed between two distinct poles: on the one hand, the commercially facilitated DIY activities of home maintenance and renovation, on the other, a diverse and often outspoken collection of practitioners including political activists, indie/alternative musicians, writers, publishers, hobbyists and 'makers'⁶⁶ for whom DIY is an everyday revolutionary act. This distribution may go some way toward accounting for participant motivation and individual agency, however care must be taken not to assume that commercially facilitated and institutionalised DIY practices are devoid of meaningful participant action. De Certeau clearly demonstrates that consumers find countless ways of using the

dominant economic order, adapting it to their own interests and their own rules (1984). These often invisible tactics of use reveal a degree of do-it-yourself in all manner of engagements; as Atkinson remarks, 'DIY practices are an intrinsic part of the material culture of everyday life' (2006, p. 9).

4.5 Common ground

The terms 'hacking', 'modding' and 'DIY' offer three distinct perspectives on a heterogeneous landscape of practices and specialised fields of knowledge. These terms collect and frame the practices, drawing them into recognizable relation with each other and actively producing them as a distinct domain. This act of ordering is an integral part of the practices themselves; these terms have emerged through both a conscious effort on the part of participants to name the various activities being undertaken, and through the performance and repetition of activities that fit (i.e. make sense within) the frame given by each term. The self-reflexive nature of this process has resulted in a high degree of interconnectedness between practices. Such cross-fertilisation is evident in Tim Hirzel's use of cold cathode lights and Perspex 'Clear Top' in the Silvia coffee machine modification. Reflecting on the project, Hirzel states:

'The inspiration comes from the computer modding culture. Modding, short for modifying, is very much in the spirit of hot-rodding cars and motorcycles. Often I will explain my espresso machine as my own version of a Harley. It features lots of shiney (sic) hardware, top quality construction, and it often helps to wear goggles ... The spirit of modding is fantastic because it continues the enjoyment one feels when researching a new purchase. The first day of ownership isn't the end of the road, it is instead a starting point for a new process of personalization, customization, and modification ... One of my hopes for the Clear Top is that it becomes just one of an increasing number of espresso machine mods.' (Hirzel, 2004)

Hirzel's project connects modding to a long tradition of consumer practices and presents a degree of continuity between these practices – a 'spirit of modding' within consumer culture. Specific acts of modification, and the specialised fields of knowledge these acts build, are knitted together by common threads – repeated motifs, meaning

65/ Atkinson takes this approach in his division of DIY into 'four discrete areas' ranging from Pro-Active DIY to Lifestyle DIY (2006).

66/ The term 'maker', and to a lesser extent 'crafter', has become prominent within emergent DIY communities due largely to its deployment by O'Reilly Media's *Make* magazine and associated blog www.makezine.com. 'Maker' is used to describe an individual with an interest in technology and an aptitude for taking apart, manipulating and building mechanical and/or electronic devices. Makers generally engage in these activities as a hobby or leisure activity.

structures and modes of operation. These common threads may be organised into a number of recognisable themes which include:

- **Diversity:** Practices actively seek diversity, constructing alternatives to mainstream, normalized social relations. This tendency to take up divergent and, at times, deliberately oppositional positions is often applied to the practice itself, producing a high degree of diversity within the practice.
- **Dynamic and emergent:** Practices are quick to adapt to changing social conditions and cultural trends. They are particularly prominent around emerging technologies and moments of socio-cultural change. This prominence may be understood in two ways: practices may be more active at moments of change, and/or they may have greater visibility during such moments.
- **Active engagement:** Practices privilege direct action that responds to specific conditions and has distinct effects.
- **Shared meaning structures:** Practices develop social networks and form cultural groups with common modes of behaviour and shared narratives. Traditions are formed through repeated motifs: unique ways of speaking, visual imagery, political views, prominent identities (heroes and villains), recognisable aesthetic styles and common ways of making.
- **Creative play:** Practices engage in creative play, including the negotiation of established rules and boundaries, problem solving, humour, personal enjoyment and the privileging of individual agency.
- **Anti-authoritarian:** Practices often challenge or evade established structures of control. Generally positioned as a demand for personal freedom, this may result in anti-corporate, anti-state, anti-professional and/or anti-academic attitudes.
- **Public:** Practices have a significant public dimension that involves performative acts articulated through a wide variety of media including: writing, speaking, film/video, photography, audio recordings/broadcasts and other material artefacts.
- **Knowledge creation:** Knowledge generated through the practice is generally documented and shared freely with other practitioners and the broader community. Participants often encourage others to copy their projects and give detailed instructions to aid in this re-

production. Additionally, participants regularly acknowledge their sources and provide links to parallel practices.

- Self-reflexive: Participants discuss the motivations, ethical positions and cultural/personal meanings produced through their practices.

4.6 Conclusion

Taken together, these themes describe a highly dynamic activity that privileges individual agency and often sits in opposition to established institutions and normalised modes of operation. The oppositional nature of these practices highlights a struggle within consumer culture. The object becomes the site of this struggle – a place where commercial and consumer interests meet and various modes of production are played out. What becomes evident from the above themes is that this struggle is both public and discursive. Hackers, modders and DIY practitioners engage in public dialogue that reflects strong ontological belief structures and actively promotes specific ways of being.

In the following chapter I will examine the nature of this discursive space, firstly by entering into this space and participating in public dialogue, and secondly by reflecting on this dialogue, identifying common modes of representation and examining the transformative nature of this discursive engagement. These two explorations appear as parallel texts within the chapter. Rather than giving an overview of the field, the texts construct partial connections, each text (re)producing the field in its own particular way. Together, the texts offer multiple perspectives on the discursive space of the object.



5. Telling Stories

Cylindric ultrasonic bat detector

Published Sunday, 10 April, 2005

<http://www.openobject.org/objectsinflux/?p=16>

African heart-nosed bats can hear the footsteps of a beetle walking on sand from a distance of more than six feet.

[Amazing Bat Trivia]¹

That's really got nothing to do with echolocation (the sonar system used by bats) or the device I'm about to describe, but it's a pretty stunning piece of trivia.

Bats are fascinating creatures and here in Melbourne they are a common sight. At dusk streams of grey-headed flying foxes leave their camp in the Royal Botanical Gardens to plunder fruit and nectar from suburban flowering gums. The number of urban bats has swelled in recent years, giving the impression that the grey-headed flying fox is thriving, but in reality Australia's bat population has decreased by 30% over the past decade. The increase in urban bat colonies is the result of ongoing destruction to the bats' native feeding grounds. The Melbourne Royal Botanical Gardens is now the only breeding colony of grey-headed flying foxes

1/ Amazing Bat Trivia, <http://www.batcon.org/discover/trivia.html> accessed 20 July 2006.

5.1 Introduction

The chapter presents two parallel narratives.

The central body of the page is given over to stories developed through the modification practice while the academic text is relegated to the margins. The stories written while engaged in acts of object modification take the form of personal narratives that document various projects carried out during the PhD research.ⁱ As research documentation, these narratives do not claim an objective, elevated position. But rather, they construct partial knowledges from within the practice (Law, 2000). Initially published on my research blog, the texts mirror established forms of user-generated content and actively engage a diverse community of amateur practitioners. Re-presented here, the texts act as

i. For a complete collection of research narratives refer to the research blog Objects in Flux, <http://www.openobject.org/objectsinflux>.

[Figure 5-1 – *facing page*]

Searching for bats with the Cylindric Ultrasonic Bat Detector, Melbourne, Australia, 2004.

material artefacts, residue of a practice that happens elsewhere. As such, they are indicative of the broader social practice being investigated and provide insight into the relations that form, and are formed through, the modification of mass-produced consumer goods.

Parallel to these texts I explore various aspects of the practices' public performance. Beginning with modes of public presentation, the discussion then turns to the types of knowledge engaged and developed through the practice, and concludes with an examination of the effect the practice has had on my own life.

5.2 How-to narratives and build logs

As discussed in the previous chapter, hacking, modding and DIY are highly social practices; however, they are also solitary pursuits and it is often the tale of the modification process, rather than the physical act, that forms the social interface for these activities. As such, the visibility of these practices within society depends largely on the mechanisms through which these tales are told. This is particularly evident where practices engage in the modification of private or domestic objects; Paul Atkinson notes that, in the 1950s, people hosted dinner parties to show off their latest DIY projects (2006). Similarly, practices of object modification often seek out or create their own social spaces where individuals can speak publicly about what they do. These social spaces may be formed through special interest groups such as clubs and societies, or via the publication of hobbyist magazines, but can also arise spontaneously in specific geographic locations such as main streets ('drag strips'), parks, cafés and bars. Developments in online self-publishing, in

in the state of Victoria. In 2001 the Royal Botanical Gardens started shooting these animals in an insane attempt to curb the local bat population. Thanks to public outcry and a dedicated group of protesters,² this practice was stopped. The grey-headed flying fox has since been classified as a vulnerable species by the Australian government.

I was once passed by a grey-headed flying fox while travelling down a deserted Punt Road at 2.00 a.m. The bat had a wingspan of about a metre; it was a mesmerising and beautiful experience. Yes, I'm quite a fan of this fellow mammal, however I'm not so obsessed that I go out at night with the specific intent of tracking them down; or at least I wasn't until I discovered there was such a thing as a bat detector.

A bat detector is an instrument that will detect the presence of bats by tuning into the echolocation ultrasounds they produce. There are a variety of commercial bat detectors available but what excited me were the numerous internet sites with home-built detector circuits. I stumbled across these sites while trying to decide what to do with a 1968 Braun Cylindric T2 cigarette lighter. What resulted was the Cylindric Ultrasonic Bat Detector.



[Figure 5-2] Finished bat detector, 2005.

My friend Gareth found the Braun Cylindric T2 cigarette lighter in a Canberra op shop; it's a stunning object. De-

2/ <http://www.austrop.org.au/ghff/home.htm>, accessed 20 July 2006.

signed by Dieter Rams in 1968 it was (according to this site³) one of Rams' favourite products. It is quite heavy – this particular version is chrome-plated steel – but it balances nicely in the hand and the large black ignition button is a pleasure to use (in fact it's oddly addictive; if I have the thing in my hand I often find myself obsessively pressing the button and I have to put the lighter down in order to stop).



[Figure 5-3] Original Braun lighter (1968), 2005.

Gareth gave me the lighter with the suggestion that I may want to turn it into something. I thought it would make a great something, so I started searching for what that something might be. And then I found this site⁴, and this site⁵, and this one⁶, and this one⁷, and this one⁸, (and the list goes on...⁹) all of them dedicated to the construction of bat detec-

3/ <http://www.designmuseum.org/design/index.php?id=103>, accessed 20 July 2006.

4/ <http://homepage3.nifty.com/jh5esm/experiments/bd16913.html>, accessed 20 July 2006.

5/ <http://www.asahi-net.or.jp/~za9t-ymmt/bat/bat3.htm>, accessed 20 July 2006.

6/ <http://www.mypage.bluewin.ch/Dufour/Daniel/Bat.htm>, accessed 20 July 2006.

7/ <http://www.jimlev.warc.org.uk/bats.htm>, accessed 20 July 2006.

8/ http://www.njsas.org/projects/bat_detector/index.html, accessed 20 July 2006.

9/ <http://home.kabelfoon.nl/~bertrik/bat/tjerk.htm>, <http://www.btinternet.com/~mr.pentops/bat.htm> and <http://home.kabelfoon.nl/~bertrik/bat/simphet.htm> accessed 20 July 2006.

particular blogging and similar forms of Web 2.0 technology, have resulted in the emergence of new social spaces. The relatively low cost and ease of access of these online spaces has dramatically increased the public nature of many amateur activities.

Numerous communal websites exist for the publishing of hacking, modding and DIY projects. These sites are often focused around a specific type of object (such as the previously mentioned computer case modding forums) or a specific manufacturer (see, for instance, the IKEA hacker websiteⁱⁱ or the Hackint0sh forumⁱⁱⁱ). Other sites have a broader focus and present information from an expansive range of practices. A prominent example of this is the Instructibles website, which was established in 2005 and currently hosts a diverse array of user generated content ranging from how to cure olives to how to make a 3D laser scanner.^{iv} Beyond these communal repositories may be found numerous accounts of hacking, modding and DIY practices published on personal websites and blogs.

Although online self-publishing is a relatively new phenomenon, the modes of representation adopted by hobbyists often follow traditions found in print-based media; step-by-step instructions, lists of tools, materials and ingredients, links to extended and alternative texts, and photographs and diagrams, are all common

ii. <http://www.ikeahackers.net/> accessed 9 January 2011.

iii. <http://www.hackint0sh.org/> accessed 9 January 2011.

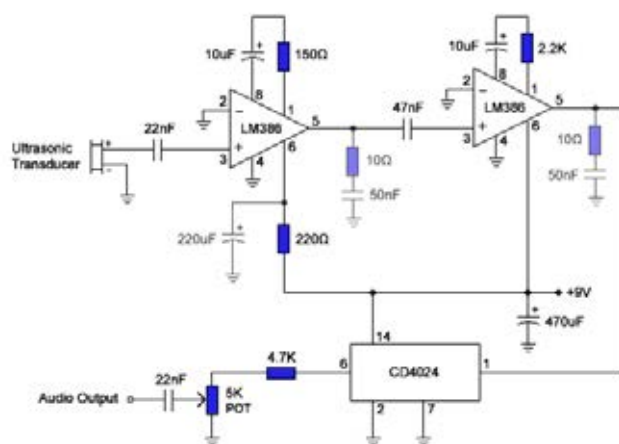
iv. <http://www.instructables.com/> accessed 8 January 2011.

features of both online documentation and more traditional explanatory texts. In addition to these formal similarities, online project documentation performs in a similar manner to the 'reader contribution' pages that may be found in numerous hobbyist magazines. These first-hand accounts, written by people actively engaged in the process being described, give a public voice to amateur practices. Despite the similarities, however, online project documentation is a significant departure from the representations found in commercial, print-based media in that online texts generally exist without a centralised organisational structure, and therefore tend to escape the editorial control and economic imperatives that influence commercial publications.

Within recent years a number of distinct forms of online documentation have become evident. The Cylindric Ultrasonic Bat Detector blog entry re-presented here may be regarded as a type of online content known as a 'How-To'. In the paper 'How-To Pages: Informal Systems of Expertise Sharing' Torrey, McDonald, Schilit and Bly define the 'how-to' as a form of 'knowledge sharing' that involves the 'sequential description of procedural information' (2007, p. 3). How-Tos typically document a single 'project' and are produced after the project has been successfully completed.^v Writers of online how-tos use a range of media to describe a project. This often includes pictures and diagrams (as with the Cylindric Ultrasonic Bat Detector) but may also involve streaming video, 3D computer models,

tors. This is the sort of obsessive social behaviour I love. I just had to join in.

After looking at more than 15 different circuit diagrams I decided to tackle the Enhanced Simple Bat Detector¹⁰ design by Tony Messina. This design is based on two audio amplifier ICs and a seven stage binary counter. It's a variation on Tony's Simple Bat Detector¹¹ with a few extra components to control amplifier gain and electrical stability.



[Figure 5-4] Ultrasonic detector circuit diagram based on Tony Messina's design, 2005.

The circuit operates as a frequency divider. Ultrasonic signals are collected by the transducer and amplified by the two LM386 audio amplifier chips. The signal is then fed to the CD4024 binary counter, which divides the frequency by 16. Output from the frequency divider is passed through a variable resistor (for volume control) and on to a high-impedance ceramic earphone. This circuit treats the ultrasonic waves as a series of binary pulses; it's basically a two-bit analogue-to-digital convertor, as the wave is either on or off. The CD4024 counts (in binary) 16 pulses and then outputs a single pulse. The resulting sound is kind of like a Geiger counter, i.e. a series of clicks. As the amount of ultrasonic noise increases, so does the number of clicks. The binary na-

v. As noted by Torrey et. al., hobbyists commonly refer to their activities as 'projects' (2007, p. 4).

10/ <http://home.netcom.com/~t-rex/SBD2.html>, accessed 20 July 2006.

11/ <http://home.netcom.com/~t-rex/BatDetector.html>, accessed 20 July 2006.

ture of the circuit means that the amplitude of the ultrasonic sound is not translated (the sound is either loud enough to trigger the counter or it's not). Hence the volume control is useful for adjusting the clicking noises to a comfortable level, but it does not make a quiet bat louder (to achieve amplitude translation a different and far more complicated circuit, like this one,¹² would be required).

Tony Messina has a useful list of parts suppliers here¹³ (he even lists Australian suppliers) but I had trouble finding a local source for the ultrasonic transducer he recommended. I decided to substitute it for a T/R40-16B (purchased from Jaycar¹⁴ for AU\$4.95; part number AU5550).



[Figure 5-5] Ultrasonic transducer, 2005.

This ultrasonic transducer can operate as both a transmitter and a receiver; I didn't use the transmitter function. The specifications for the transducer give a centre frequency of 40kHz. This is a standard frequency for most ultrasonic devices and luckily it's also a common bat frequency. Tony suggests de-tuning the transducer with a 6.8mH RF choke. When wired in parallel across the transducer the choke flattens the transducer's frequency response. The transducer will be less sensitive at 40kHz but will have a larger

downloadable templates, tool paths and audio files. The style of presentation adopted by the online how-to can vary greatly, ranging from concise step-by-step instructions to extended narratives that document the author's journey through the project, complete with mistakes and workarounds (Torrey, et al., 2007, p. 3). Writers generally adopt a first-person narrative mode when describing their projects; statements such as 'next I' and 'I decided to' are prominent in online how-tos. However, it is also common practice for writers to address the reader directly with second-person instructional comments such as 'next you' and 'if you can't find a'. Often these two modes of expression are combined in a single text, producing a narrative that roams between personal description and reflection, directional instruction and general advice.

Closely related to the How-To presentation style is the 'build' or 'work log', a collection of online texts that document a project as it unfolds over an extended period of time. Projects presented in the form of build logs are often highly complex and may take a number of years to complete. Build logs are particularly prominent within practices of computer case modding, where dedicated forums exist for publishing and commenting on project development. This form of build log is often called a 'mod guide'.^{vi} Less structured build logs may be found on hobbyists' personal websites, often presented alongside personal news

12/ <http://homepage3.nifty.com/jh5esm/experiments/bd4066.html>, accessed 20 July 2006.

13/ <http://home.netcom.com/~t-rex/BatDetectorParts.html>, accessed 20 July 2006.

14/ <http://www1.jaycar.com.au/>, accessed 20 July 2006.

vi. See the previous chapter for a more detailed account of computer case modding practices. For an example of computer case build logs see Overclockers Case Mod Work Logs, <http://www.overclock.net/case-mod-work-logs/> accessed July 25 2010.

and miscellaneous items of interest. Individual build log posts often end with a description of what remains to be done to complete the project and may ask for reader assistance in resolving specific design problems. An interesting aspect of the build log is that if a project has remained inactive for an extended period of time, often a number of months, the project's author may apologise for their lack of activity. Such apologies suggest that writers feel a sense of obligation to both their practice and their readers.

The B&O MP3 Mod project, developed as part of my research into computer case modding communities, adopted the build log as its main form of public presentation. This project was developed over a period of three years and presented across 13 build log posts. The B&O MP3 Mod project involved integrating an Apple Macintosh PowerBook computer into a 1979 Bang and Olufsen BeoCentre 4500 stereo to produce a large-format MP3 player. The completed project won first prize in the 2006 MacMod Challenge.^{vii} The blog entry re-presented here, 'Woz is God,

vii. MacMod.com was a community news site for discussing and publishing computer case mods based around Apple hardware, in particular Macintosh computers. The MacMod Challenge was an annual computer case modding competition that accepted entries from the case modding community. Participants were required to submit a build log, including photos of the construction process and finished object. MacTech Magazine purchased MacMod.com in 2009. Despite claims that content from the MacMod site would be merged with the MacTech network, much of the community-developed content from MacMod.com, including the MacMod challenge pages, are now inaccessible. <http://www.mactech.com/macmod-announcement> accessed 6 January 2011.

frequency range (possibly as great as 20 to 50kHz) and will respond to a wider variety of bats. Unfortunately introducing an RF choke caused my circuit to oscillate so I left it off (it may be a problem with the type of transducer I'm using). I also omitted the stability components (the 10 ohm resistor and 50 nF capacitor) from the amplifier ICs because of problems with oscillation, and I removed the 220 uF power capacitor because I ran out of space inside the lighter. (With the 220 uF cap. removed you could also omit the 220 ohm resistor, but mine was already soldered in so I didn't bother. The missing components are shown greyed-out in the circuit diagram above.)



[Figure 5-6] Original Braun lighter – disassembled, 2005.

Disassembling the lighter took a couple of minutes. There were just two screws holding it together; it's a very impressive design. With the fuel tank removed the lighter was a hollow shell; I needed some kind of internal structure to mount the circuit and switch assembly. I turned to my boxes of miscellaneous crap and I found this:



[Figure 5-7] Discarded ink cartridge, 2005.

Actually I found 12 of them. I wouldn't call myself a hoarder but I guess I have to ask myself just how many spent ink cartridges I need. Right now I just need one.



[Figure 5-8] Fitting the ink cartridge, 2005.

The ink cartridge wedged firmly into the lighter's shell and by inserting a metal tag into the cartridge's outlet I was able to screw it in place. Once the cartridge is installed there is just enough space to slide a 9V battery down beside it. Opposite the battery I mounted an extra-large micro switch. The micro switch is positioned under the lighter's large black button and gives a nice audible 'click' when pressed.

or possibly the antichrist', is post number 11 in the series and documents the development of the music player's control interface.

A major aim of the online how-to or build log is to assist readers in copying or building upon the project being presented. Torrey et al. found that 'one of the most satisfying outcomes ... for participants was the news that someone else had built their project and personalised or made improvements to it' (2007, p. 14). This open approach towards the sharing of knowledge is common amongst practices of object modification and is sometimes formalised through the use of 'copyleft' licence agreements. These licences typically grant permission for the copying, modification and redistribution of a work while limiting the proprietary nature of any reproductions or derivative works. Common examples of copyleft licence agreements include the GNU General Public Licence prominent within Free Open Source Software (FOSS), and liberal Share-Alike Creative Commons licences.^{viii} This culture of appropriation and re-use positions knowledge as a communal resource and mirrors belief structures found in hacking and counter-culture movements of the 1970s. Similar liberal attitudes towards property rights can be found operating in a diverse array of contemporary practices, from

viii. For details on the GNU General Public Licence see <http://www.gnu.org/licenses/gpl.html> accessed 31 December 2010. For Creative Commons licences see <http://creativecommons.org/> accessed 31 December 2010.

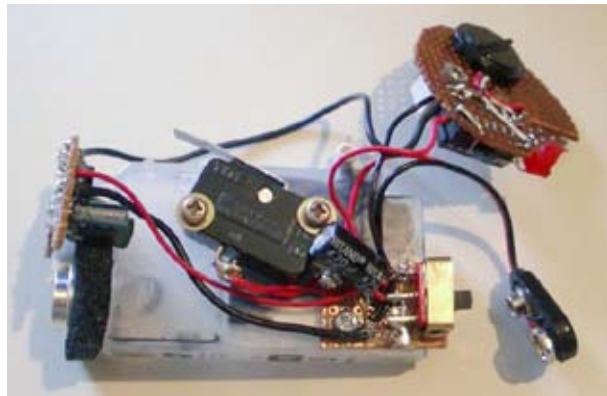
ix. Popular public wiki websites include Wikipedia <http://en.wikipedia.org/> accessed 30 December 2010, Wikibooks <http://en.wikibooks.org/> accessed 30 December 2010, and Wikitravel <http://wikitravel.org/> accessed 30 December 2010.

wiki-based knowledge-sharing projects^{ix} to guerrilla gardening (Reynolds, 2008). These practices often challenge dominant commercial structures and institutionalised logic.

Although receiving feedback from people who have completed or extended a project is highly valued by practitioners, providing this feedback is not an essential part of modification practices. In establishing an open approach towards knowledge sharing, practices of object modification exist in an environment where permission to copy a project need not be sought from the project's author. As such, practices may use and build on existing material without any direct contact between the individual practitioners. There is, however, a strong belief (often formalised within copyleft licence agreements) that practitioners should acknowledge their sources. Online project documentation therefore rarely exists in isolation and the referencing of source material has become an important mechanism through which practitioners build social connections and participate within an extended community. In practice, project documentation generally does not reference every piece of related information; How-Tos surveyed by Torrey et al. present a maximum of five outbound links per project.^x

The extensive use of external reference material in developing a project is, in part, a condition

x. By contrast, the Cylindric Ultrasonic Bat Detector text contains 18 outbound links. This high number of references may be attributed to the academic context in which I am operating, which encouraged an accurate account of every resource used during project development and documentation.



[Figure 5-9] Assembling the components, 2005.

I also installed a second switch in the circuit: a mini slide switch. Both switches can be seen in the above image. The micro switch is a momentary type and is designed for hand-held operation of the detector. The slide switch is an on-off switch that provides for hands-free operation (i.e. when the detector is sitting on a table).

When I started the mod I decided that I didn't want to damage any of the existing components (in case I ever wanted to return the lighter to its former glory). This placed some interesting constraints on the mod. I wanted the bat detector to have: an exposed ultrasonic transducer, a headphone socket, a volume control, an on-off switch and a power indicator LED. Locating this functionality within Rams' minimal interface design was at times quite a challenge.



[Figure 5-10] Fitting the ultrasonic transducer, 2005.

Yet at other times it wasn't. The installation of the ultrasonic transducer was totally straightforward: the existing flame

outlet on the lighter seemed made to order (the transducer can be seen here set in black foam to isolate it from handling noise). Apart from the large momentary button on the side, all controls were located in the base of the lighter.



[Figure 5-11] Original Braun lighter – base, 2005.

There was a small hole here for refilling the lighter. It was too small for a standard 3.5mm audio plug but could accommodate a 2.5mm plug (with a few modifications to the plug). The problem with locating the headphone socket here was that I wanted the detector to work while sitting upright, but in this position the base of the lighter has a clearance of only 2mm from the table surface. I needed a right-angle 2.5mm headphone connector with a depth of just 2mm – not the sort of thing Tandy has lying around.



[Figure 5-12] 2.5mm mono audio plug, 2005.

So I attacked a standard 2.5mm plug with a file,

of the amateur nature of hacking, modding and DIY – participants may not possess the experience or knowledge necessary to carry out their project unassisted – but it is also a result of the highly experimental and cross-disciplinary nature of these activities. Often, projects are not confined to specific areas of specialization and may bring together a broad range of influences and expertise. This diversity can be seen in Tim Hirzel's coffee machine modification, discussed in the previous chapter, which combines knowledge of industrial control systems with gestural control interfaces and aesthetic conventions from the computer case modding community (Hirzel, 2006).

While outbound links are an important mechanism through which project authors can position themselves within a networked community of practitioners, it is generally the existence of inbound links (or 'back links') from external sites that gives a project visibility within the public realm. Links to project pages from parallel practices, forums, news and aggregator sites increase a project's readership and enhance the likelihood that the project will be copied or built upon by others. Inbound links generate page traffic in two specific ways: directly via 'click-through' visitors who follow the link to the project page, and indirectly by increasing the page's ranking on Internet search engines, thus increasing the likelihood that the project will be found when project specific content is searched for by others. Inbound links may also lead to additional outbound links through a process of 'reciprocal linking'. Reciprocal links may be automatically generated by 'track-back' systems, such as those commonly found in blogging soft-

ware, or they may be manually added to project documentation by the author on discovery that a significant site or individual has referenced their project.^{xi}

A number of the projects developed for this research were linked to by popular Internet news sites such as Hack a Day and the Make blog.^{xii} These links dramatically increased traffic to the specific project pages and to the site in general. On 15 May 2005 the Cylindric Ultrasonic Bat Detector post was linked to from the Make blog. Within 24 hours this page's traffic had risen from an average of 25 visitors a day to over 2,500.^{xiii} Within five days traffic to the site had subsided to 100 visitors a day and after a week it had stabilised at around 40 visitors per day. Although peak traffic lasted only a few days, the increase in daily traffic appears to be a lasting effect of this exposure. Participants surveyed by Torrey et al. expressed deep sat-

xi. See for example, NeX's Gameboy video out module featured on hackaday.com, <http://nex.gg8.se/modblog/2010/04/gameboy-video-out-out-module-in-a-video-casette/> accessed 5 January 2011; Thomas E. Henz's split keyboard modification featured on hackaday.com, <http://henzconsulting.com/Pages/Projects/keyboard.htm> accessed 5 January 2011.

xii. http://blog.makezine.com/archive/2005/05/cylindric_ultrasonic_bat.html and <http://hackaday.com/2005/02/28/covert-desk-lamp-mic/> accessed 3 January 2011.

xiii. This experience is similar to the account given by Torrey et al. in which a participant's site traffic went from an average of 40 visitors a day to 12,000 after appearing on Digg.com's front page (Torrey, et al., 2007). Digg.com is an online community that collects and votes on newsworthy links. Links that receive many votes are displayed on Digg's front page.



[Figure 5-13] Modified 2.5mm mono audio plug, 2005.

and ended up with this.



[Figure 5-14] Modifying the switch, 2005.

I had to do similar mods to the slide switch and LED, cutting and filing them to fit the air vents in the base of the lighter.



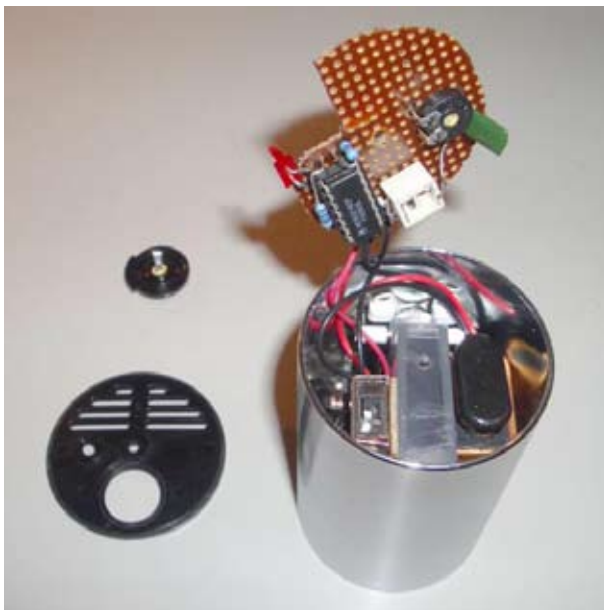
[Figure 5-15] Constructing the volume knob, 2005.

For the volume knob, I reused the lighter's flame control dial. With the help of some heat shrink tubing, I attached a squashed aluminium rod to the dial.



[Figure 5-16] Installing the volume knob, 2005.

The rod passed through the circuit board and into the centre hole of the volume trim pot.



[Figure 5-17] Fitting the components, 2005.

Here you can see the battery, ink cartridge and switch assembly being fitted.

isfaction from having their projects referenced by these popular news sites (Torrey, et al., 2007). This was also true of my own experience; there was a thrill associated with having this level of public exposure, particularly the first time this occurred. As time passed however I found that subsequent links and associated increases in visitor numbers were of less importance to me and I began to realize that it was not the number of visitors that I valued but rather their level of engagement with the various projects on my site.

Both online How-Tos and build logs typically provide readers with a mechanism for interacting with the project author and one another. This often takes the form of a comment system that allows visitors to the site to leave text messages, hyperlinks and occasionally images. Comments are often informal and congratulatory in nature although extended feedback, questions, personal stories and suggestions are also prevalent. Gregory Turner-Rahman notes that discussions on web-based design portals are often 'laconic and quite vapid' (2008, p. 384, endnote 3). A similar observation could be made of the comment posts on How-Tos and build logs, however, as noted by Torrey et al., project authors are often active in moderating this communication, ignoring or deleting comments that are judged ill-informed or offensive while engaging and extending the conversation on other fronts (2007, p. 14).

It is not uncommon for reader comments to evolve into a discussion between multiple participants. Comments posted to the Cylindric Ultrasonic Bat Detector project page include a three-way exchange between an amateur bat

enthusiast, a wildlife ecologist and myself.^{xiv} Also of note was an extended exchange with a hobbyist who had copied my project and made modifications. Images of this modified project were latter added to the Cylindric Ultrasonic Bat Detector page.

Although the online How-To and build log are common within practices of hacking, modding and DIY, they are not the only forms of project representation. Some practitioners present their projects through images or video without accompanying text (often using media-sharing sites such as YouTube^{xv} or Flickr^{xvi}), while others choose to publicly display their work at special events such as club meetings, fairs or parties.^{xvii} It may also be assumed that many projects go unrepresented within the public sphere and thus remain largely invisible. Traces of these unseen acts are discernable in reader comments and questions that give reference to the struggles or successes a practitioner may have.^{xviii}

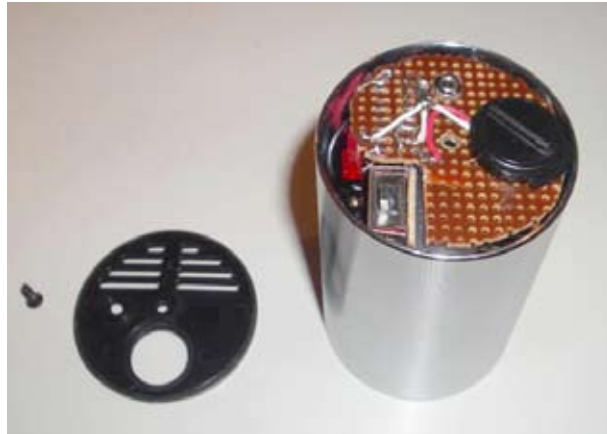
xiv. An important outcome from this discussion was the realisation that the Flying Fox (the bat I was attempting to listen to) does not use sonar echolocation.

xv. YouTube is a popular video sharing website.

xvi. Flickr is a popular photo sharing website.

xvii. These events include LAN parties, see Chapter 3, footnote 47; science fairs such as the popular Maker Faire, <http://makerfaire.com/> accessed 8 January 2011; and student events such as Campus Party Europe, <http://www.campus-party.eu/Modding.html> accessed 8 January 2011.

xviii. For an example of reader comments that indicated participation in practices of object modification see the comments section of my blog post Home Made Pokia, <http://www.openobject.org/objectsinflux/?p=21> accessed 6 January 2011.



[Figure 5-18] Final installation, 2005.

With everything installed there was very little space left over.



[Figure 5-19] Finished bat detector, 2005.

The completed bat detector is almost identical to the original Braun lighter. The only visible differences are the ultrasonic transducer on the top,



[Figure 5-20] Bat detector active, 2005.

and the controls I've added to the base. It even weighs about the same.

And it actually works (I'm always surprised when that happens). If you don't have a bat on hand you can test a bat detector by pointing it at fast-running water; just turn your kitchen tap on full and start the detector. The faster the water, the more ultrasonic sound is produced.



[Figure 5-21] Bat detector at VCA gallery, 2005.

The bat detector has just spent three weeks at VCA gallery¹⁵ in an exhibition called 'slave'¹⁶ curated by Christopher LG Hill, Kain Picken, Rob McKenzie and Nick Selenitsch. (No bats were found.)

15/ <http://www.vca.unimelb.edu.au/art/gallery/index.html>, accessed 20 July 2006.

16/ <http://www.vca.unimelb.edu.au/art/gallery/program2005.html>, accessed 20 July 2006.

5.3 Fictional narratives

In many respects, practices of hacking, modding and DIY may be regarded as forms of research activity. The various processes undertaken – the public presentation of projects, linking to parallel practices, providing feedback and advice to peers, and encouraging others to copy or extend existing works – mirror activities found in institutionalised research practices. There remains, however, something excessive in the practice of object modification that is not reducible to the creation, presentation and exchange of knowledge.^{xix} This excess brings a motivated, personal, social and playful dimension to project descriptions. Project documentation often develops complex storylines with strong narrative themes such as romance, hardship, tragedy, heroic struggle, and triumph.

In Tim Hirzel's coffee machine modification a fictional love story is constructed between the coffee machine and microcontroller, and presented online in the form of the video, 'Arduino and Silvia: Two Italians, One Tangled Affair'.^{xx} Fictional narratives such as this typically draw on and extend existing social structures. In the case of the Arduino-Silvia romance, Hirzel expands and rewrites the Rancilio advertising material that presents his particular model of coffee machine as 'Miss Silvia'.

De Certeau claims that narration is not 'a question of approaching a "reality" (a techni-

xix. It has long been argued that this 'excess' is also present in 'proper' research (Trawick, 1988).

xx. <http://growdown.blogspot.com/2008/04/arduino-and-silvia-two-italians-one.html>, accessed 18 July 2010.

cal operation, etc.) as closely as possible', but rather involves the creation of 'fictional space'. Narration 'moves away from the "real" or rather it pretends to escape present circumstances in precisely that way, it makes a hit (coup) far more than it describes one' (1984, p. 79). Within practices of hacking, modding and DIY, material interventions and textual descriptions act in the same mode, performing manoeuvres within a given social field that 'figure' that field in new and alternate ways. The fictive space produced by project documentation parallels and reinforces the fictions present in the material manipulation of the object.

Fictional narratives are particularly evident in practices of object modification that connect with artistic genres such as fantasy or science fiction. A clear example of this can be found in the modding practices associated with steampunk. This sub-genre of science fiction combines 19th century fashion and culture, generally from Victorian era Britain, with futuristic, speculative and anachronistic technology. Often associated with the works of H. G. Wells and Jules Verne, steampunk emerged as a distinct subculture in the late 1980s and early 1990s (Clute and Grant, 1997).

Australian steampunk enthusiast Cliff Wins, a.k.a. Maduncle, has modified numerous objects, combining contemporary 21st technology with Victorian era aesthetics. In presenting these projects on his personal blog site Wins has developed a narrative voice that interweaves fictional tales with accounts of the modification process. In one of his more inventive posts Wins re-casts the local football crowd as marauding zombies and speaks of creating

Update 17 September 2009

Steven has been experimenting with the circuit (see the comments) and reports to have increased sensitivity by adding a 0.1 uF capacitor from the amplifier stage (Steven has connected to pin 1 on the binary counter) to the potentiometer. He reports:

here is the picture of the cylindric bat detector i made from the cylindric bat detector site i spread the parts out a little so theres less likely to be any interfearence . ive shortened the wires from the board to the jaycar electronics transducer so that eliminates the need to bround myself to the positive like i did and ive added a 0.1uf mkt cap from pin 1 of the binary counter to one of the pins i have the pot wires solderd to works excellant have yet to do some outdoor testing away from the suburb and out in the bush



[Figure 5-22] Bat detector by Steven, 2009. Photograph Steven.

Nice work Steven, thanks for the update.

Selected comment responses posted to the blog

Eva Newman Says:

3 August, 2005 at 12:27 p.m.

Voila, love your personal bat detector and if I may, will add your site somehow to our wildlife info web page ... but at this stage I'm just happy to find a group of people that may be able to help me with a similar problem. I need a noise detector.

The problem: The Woodend (Ipswich, Qld. Australia) Flying Fox colony is currently harrassed on a regular basis by

something. Since I can't hear who or what is keeping those poor animals awake all day ... I would like to start finding out if someone is emitting some sounds the human ear can not hear, but Flying Foxes can hear. (It is worth noting that I have NO idea how well Flying Foxes hear, but I'm told that they do NOT use sonar, but have "better than human" hearing.)

Its heartbreaking to see the poor Flying Foxes being harassed by who knows what on an ongoing basis (this has been happening since late January and it is NOT typical bat behaviour) ... so if anyone help this electronically and gadget challenged 59yo ... it would be most appreciated.

Cheers Eva

Scott Says:

5 August, 2005 at 11:25 a.m.

Hi Eva,

Your comment that Flying Foxes do NOT use sonar took me by surprise. I've been trying to listen to them with my bat detector and (either through wishful thinking or nearby running water) I though I was having some success. So I did some research and of course you're right, only Microbats use echolocation and the Flying Fox is a Megabat (apparently there is one Megabat that does use echolocation but it's not found on the Australian mainland). I need to find myself a colony of Microbats.

As for your disturbed Flying Foxes it seems that a bat detector would be of little use. I found this site (run by the Ipswich local council) which states the Flying Fox's "hearing range is similar to that of humans, making high-frequency sound inaudible to them". Over at the Sydney Botanical Gardens site is an account of the actions taken to disturb the Flying Fox colony; these include sound, light and odour. It might be helpful to compare your bats' behaviour to these descriptions. The only actions that seemed to produce a prolonged disturbance were deep percussive sounds (and even these have had little effect since 1998), so ultrasonics do not appear to be your answer. In this case a simple tape recorder may be useful. This will not extend your hearing range but it could be used to emphasise any low frequency sounds and help locate their source.

The best of luck, Scott.

Eva Newman Says:

11 August, 2005 at 11:40 a.m.

Hello Scott,

Thank you so much for bothering to reply. Much appreciated. I'm aware of the two web pages you pointed out, and they are pretty useless and really, not enough research has

and deploying defensive devices to protect his home from attack.

'The zombie detector, or 'ambivolometer' gave first warning of the impending attack with the gauge showing a slight increase in the level of general disinterest in life in the general area. A Quick peek through the observer gave us our first indication of the lay of the land... Our fears were confirmed – zombies on the perimeter! It was 'all hands to the pacifier guns' stationed around the lab. These pressurised vessels contain enough atomised bourbon and coke mix to send the zombies packing.'^{xxi}

Here Wins makes a game of a situation that is largely beyond his control, figuring an alternative world where he claims an active role and regains a degree of agency. It is clear from Wins's writing that modding practices extend well beyond the manipulation of objects. This is in keeping with Schatzki's description of practice as 'a temporally unfolding and spatially dispersed nexus of doings and sayings' (1996, p. 89). Wins's practice is scattered across his everyday life; it appears in his blog writing, his visits to second-hand stores, his holidays, his New Years Eve costume and his appreciation of art and culture. It threads itself through his world, binding it together as a coherent whole.

5.4 Disembodied knowledge

Practices of object modification tend to encourage a 'learning-on-demand' approach where problems are addressed as they arise. This

xxi. <http://austeampunk.blogspot.com/2008/07/zombie-assault.html> accessed 6 January 2011.

mode of engagement is similar to computer hacking practices. As Raymond notes in 'How to become a hacker', 'You... have to develop a kind of faith in your own learning capacity – a belief that even though you may not know all of what you need to solve a problem, if you tackle just a piece of it and learn from that, you'll learn enough to solve the next piece – and so on, until you're done' (2001). Here, knowledge is experienced through action; I understand the Apple Desktop Bus as I wire up a control interface, and I understand copyleft licence agreements as I engage in a process of choosing one. Often highly specialised and context specific, knowledge is positioned as a tool to be taken up in the service of a particular task.^{xxii}

This fragmented and disembodied approach to knowledge is a direct challenge to notions of professionalism. If knowledge can be accessed and deployed by anyone, then fields of specialisation become open to the non-professional. This can be a liberating experience for individuals. As an object modifier my capabilities are not limited by what I know, but rather by my willingness to access knowledge and deploy it within my own life; things beyond my knowledge are not necessarily beyond my abilities, they are simply domains of action I have yet to engage with. This attitude dramatically shifted my relationship to the material world. Object manipulation is no longer the domain of experts; I have granted myself permission to actively intervene.

xxii. This understanding matches sentiment found in The Whole Earth Catalogue (Brand, 1968), which has as its title by-line, 'access to tools'.

been done with megabats in this area anyhow.

Please keep listening to your bat detector, you may well be right and their hearing also incorporates some sonar... who knows.

I'd love to get my hands on a bat detector, so if ever you know of anyone having a spare one, please think of us. In the meantime, microbats can live in the same area as megabats (I know in the Ipswich Megabat colony there are also microbats... so maybe you ARE having some success but just haven't located the correct source of the sound). Either way, I'll cross my fingers for you.

Cheers and thanks again, Eva

Eva Newman Says:

11 August, 2005 at 11:42 a.m.

... just one more thing you may find of interest, but which has no scientific backing at all and which may well be wishful thinking on MY part. However, we observed the following during my time raising baby Flying Foxes:

I raised one particular Flying Fox which, like my dog, heard my car approach very much earlier than any of my family members. SO (although I have no proof) I do believe they may have a much better hearing than currently given credit for. Agreed that this may not extend to hearing a dog whistle (which I understand to be in the sonar range??) but it sure was good. She became exited my car was still at least 300m away from my house, and the distance could even have been further than this, however, as it was just an ongoing observation and not an experiment. Family members noticing that the bat was regularly calling out to me well before I drove into the drive way was spasmodic and too frequent for coincidence, however, we never got it down any more exact than this. It is also worth noting that even the dog reacted slower to my approach than the bat, although it was a British Bulldog, which may well be in itself the explanation.

Cheers again, Eva

Scott Says:

11 August, 2005 at 11:54 a.m.

Thanks Eva, what a great story!

If anyone out there has a spare bat detector please contact Eva through the <http://www.noahsark.org.au> website.

Ryan Says:

October 18th, 2005 at 7:02 pm

Hi Scott,

Nice piece of work. I am a wildlife ecologist and make regu-

lar use of ultrasonic detectors to detect, record and identify microbat echolocation calls. Yes, only microbats use ultrasonic echolocation but fear not, there are heaps of microbats cruising around the urban areas eating insects (although obviously there are greater numbers out bush). You may well have been hearing microbats via your detector. Through the detector speaker you can hear the calls as a series of rapid clicks. These clicks become more rapid and rise in frequency into what is called a 'feeding buzz' when the animal is closely tracking its insect prey. These clicks then usually suddenly stop when the animal has either missed the final stage of the inflight interception, or ... it suddenly has its mouth full!! Most bats call in the range of about 20-70kHz in Victoria. Most adult humans can only hear up to about 15-16kHz, children up to about 20. Dogs can hear higher – prob. up to about 40kHz I think. I have held a microbat in my hand when there was a dog nearby and although I couldn't hear anything the dog pricked up its ears and wouldn't take its eyes off the bat!! There is one bat species in Victoria that calls within our hearing range (down to about 10kHz) - we hear it as a regular, high frequency (high for us but low for bats) pinging noise above the trees and roofs. Most people just assume it is an insect but it is the White-striped Free-tail Bat, so named because it has a white stripe through its brown fur down either side of its body. No-one has worked out what the stripes are for and both sexes have them.

One of the cheapest commercial bat detectors is available from Titley Electronics, the Anabat Detection system. See <http://www.titley.com.au>

Eva,

I am not an expert on megabats but there is a device for keeping birds and flying foxes out of fruit orchards called The Phoenix Wailer, which makes use of a series of speakers which emit irregular sounds. The speakers are a certain distance apart so that the sound waves end up colliding over the orchard and creating a sound that some animals find disturbing apparently. It has been trialled at the Melb Botanic Gardens without much success. Perhaps someone is directing something similar at your colony?

As for your flying fox, it may be that she is hearing the high frequency noises from your car engine. Grey Headed Flying foxes can actually hear up to about 54kHz, however high frequency sound doesn't usually travel as far as lower frequencies so it would have to be pretty intense sound for her to pick it up at that range, or else she has great ears!!

Cheers, Ryan

Although access to knowledge is often readily available, the selection and deployment of this knowledge may require a high degree of judgement and skill. For the novice practitioner, guidance may be obtained from community forums and other online resources. This information may be accessed through search results on a particular topic or via direct responses to questions posed by the practitioner. This learning-on-demand approach worked particularly well for practices that could adopt a trial-and-error approach (such as software development), however, I found it was less suited to outcome-critical activities where errors could cause financial or personal loss. In these situations, accounts from practitioners who had successfully completed the procedure being attempted were particularly reassuring; generally, the more difficult or risky the procedure, the greater the number of personal accounts I sought out and read.

While writing software for the B&O MP3 Mod project, information from online sources was invaluable. At the commencement of the project I had no knowledge of Objective-C, the programming language I used to write the control interface. Through the use of Apple's official development pages, community forums and individual's personal pages, I was able to develop a functioning user interface. I supplemented this online knowledge with two printed texts, Learning Cocoa with Objective-C (Davidson and Apple Computer Inc., 2002) and Core Mac OS X and Unix Programming (Dalrymple and Hillegrass, 2003). While the online resources were well suited to solving specific problems, the printed texts were better structured to provide a general introduction to programming

principles. From personal experience, task-oriented learning tended to produce a patchwork collection of knowledge that did not always give a clear overview of the field in which I was operating.^{xxiii}

The eclectic scope and task-oriented nature of these practices often meant that knowledge I accessed, developed or deployed for a specific project was not readily retained in my memory. Documenting projects for public presentation provided an opportunity to reflect on this knowledge. While preparing project documentation I often found additional research was required to bring a suitable level of clarity to the presentation. Although this documentation was generally produced for public consumption, it also served as a useful reference for my own practice and on a number of occasions I returned to my own project documentation for guidance when developing new works.^{xxiv}

5.5 Embodied knowledge

Aside from the disembodied knowledge discussed above, a second form of knowledge is discernible within practices of object modification – an embodied knowledge that is locally constituted and intimately bound to the practitioner and the place of action. This knowledge is equivalent to a way of working, acting or being. It is, in its extremes, both de Certeau's 'ways of

Woz is God, or possibly the antichrist.

Published Thursday, July 20, 2006

<http://www.openobject.org/objectsinflux/?p=8>

As I was contemplating a title for this post I realised that 'woz' is 'god' backwards, or at least it's 'god' transposed onto a backwards alphabet. Check it out:

```
a b c d e f g h i j k l m n o p q r s t u v w x y z
z y x w v u t s r q p o n m l k j i h g f e d c b a
|       |               |
```

Take the letter "o" as the rotation point, flip the alphabet backwards and then transpose the word 'god' onto the reversed alphabet. You get 'woz'.

I'm talking about Steve Wozniak (co-founder of Apple Computer; you can read about Woz at Wikipedia¹) and although he may not be an actual god (or even the antichrist; notwithstanding that whole \$666.66 pricing issue...²) he is quite amazing. In '86 a friend of mine at Yarrawonga High got a 'limited edition' Apple IIgs signed by Woz (Apple made at least 10,000 of these 'limited editions'). I remember thinking, 'you'd have to be pretty special to get your name on a computer.' Woz is pretty special (and probably a bit of a dork, but hey, in the 80's being a dork could be truly cool, not just faux-cool like it is now).

The reason I mention Woz is that I've just been messing around with the Apple Desktop Bus³, a system Apple used to connect keyboards and mice to their computers. Woz developed the ADB in the mid '80's (it was later replaced by the industry standard USB, however, due to its simplicity it was still being used internally on Apple laptops as recently as 2005). ADB's simplicity epitomises Woz's approach

xxiii. See the blog post The Unknown Unknown for a discussion of the difficulty in seeing the gaps in your own knowledge, <http://www.openobject.org/objectsinflux/?p=14> accessed 16 January 2011.

xxiv. The use of one's own documentation as a reference guide is also noted in Torrey et al.'s study of How-tos (2007).

1/ <http://en.wikipedia.org/wiki/Woz>, accessed July 20, 2006.

2/ See the original Apple I print ad, www.apple-history.com/images/apple1.gif accessed 20 July 2006.

3/ http://en.wikipedia.org/wiki/Apple_Desktop_Bus accessed 20 July 2006.

to hardware and software design. It uses just a single data line, yet it allows for up to 16 devices to be daisy-chained together on the one bus. ADB manages this by having the system assign a temporary four-bit address to each device on the bus. Because the system takes control of assigning addresses you can have multiple instances of the same device (i.e. a number of identical keyboards or mice) on the same bus, all functioning correctly at the same time.

ADB is also extremely simple to implement in hardware. This is the inside of an ADB mouse.



[Figure 5-23] Macintosh ADB mouse – internal workings, 2006.

As you can see, the component count is very low, comprising two optical encoders (the black wheels), a button and a single IC. All communication is sent on the red wire, the blue wire is +5v (bad colour-coding if you ask me), one black wire is GND and the other is the cable shield (keyboards have an additional wire they use for power-on switches, but the mouse obviously doesn't need one of these). Hardware costs are so small that they generally amount to less than the price of the connecting cable.

ADB's ability to daisy-chain devices together makes it very useful for my B&O MP3 mod. Early in the mod I decided it would be nice to use the B&O's existing slider to control music track selection. I investigated various ways of implementing this (including reading variable resistor values through

operating' – 'the innumerable practices by which users reappropriate the space organised by techniques of sociocultural production' (1984, p. xiv), and the very embodiment of those 'techniques of sociocultural production', Foucault's 'discipline' – 'structure and power that have been impressed onto the body forming permanent dispositions' (Eriksen and Nielsen, 2001, p. 130). De Certeau's 'ways of operating' define a mode of resistance within everyday practices, a means by which practitioners can exercise a degree of agency from within an authoritarian institutional domain. By contrast, Foucault's 'discipline' describes the internalisation of order where individuals perpetuate institutionalised relations through adopting and repeating the forms that are proper to that institution. De Certeau's 'ways of operating' will be discussed at length in the following chapter. What follows is a brief examination of actions that do not appear to arise from individual agency but have instead been written into the body through a repeated engagement with the practice.

Engaging in a specialised practice necessarily involves the adoption and repetition of the customs, aesthetics and procedures of that practice. While at some level, this is clearly a conscious act, it can also be argued that practices impress themselves onto practitioners, repeating the practice's own internal logic through the actions of the individual. As Alan Warde claims in 'Consumption and Theories of Practice', 'the conventions and the standards of the practice steer behaviour'. Using the example of hot-rod enthusiasts, Warde observes that 'modified vehicles, manuals and magazines, memorabilia, 'records of auto-racing sounds', etc. are more

directly the consequence of engagement in the practice of a particular motor sport than they are of individual taste or choice' (2005, p. 137). Taking this further we may ask, what does the practice of object modification demand of the individual? Or, posing this question in a slightly different light, how does the discipline of object modification construct individuality? Through such questions, institutionalised relations begin to become apparent within practices of object modification.

When commencing the B&O MP3 Mod project I set about selecting and purchasing a suitable computer to modify. I wanted this computer to represent value for money so I investigated the second hand market via eBay^{xxv} and began to record the sale prices for various Apple Macintosh computers that satisfied my requirements. During a period of two months I recorded results from over 250 sales. At the time I understood this level of engagement to be somewhat excessive, but there was something in the repetition of this process that was compelling. Eventually I decided on a computer and made a purchase: a 1998 Wallstreet PowerBook. Having completed this task, however, I continued, without any obvious reason, to track the second-hand computer market. My accumulated knowledge allowed me to read subtle fluctuations in price and computer performance and recognise a 'good buy' when I saw one – in the following four months I purchased two additional Wallstreet PowerBooks.

xxv. Ebay is a popular online auction and shopping website through which individuals and businesses buy and sell goods and services.

the Mac serial port) but in the end I decided that the simplest hardware and software approach was to mod an ADB mouse. Connecting the mouse to the PowerBook should be a simple matter of locating the internal ADB data line.

In the PowerBook G3 and G4 systems (released prior to 2005) the ADB controller is integrated into the power management IC (PMU). The PMU is on a separate board to the main processor; in the Wallstreet it's located under the right-hand side of the upper shell (for detailed Apple laptop take-apart instructions check out this great site⁴). The track-pad is connected to the PMU via a flex cable.



[Figure 5-24] PowerBook G3 – internal workings, 2006.

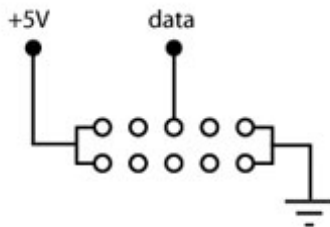
The flex cable connects to a 10-pin socket on the PMU board. With the flex cable removed, the socket looks like this.



[Figure 5-25] PowerBook G3 – internal ADB connector, 2006.

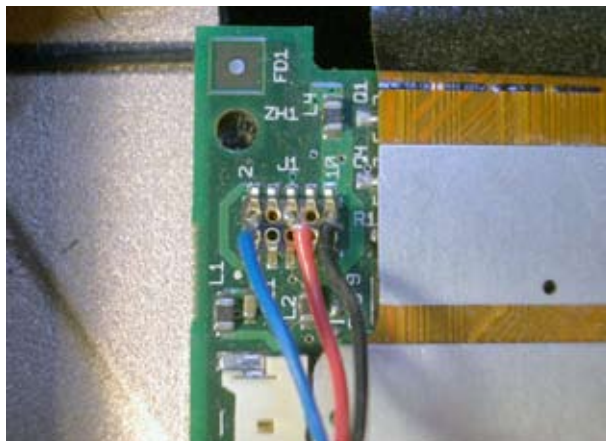
4/ Wallstreet take-apart instructions, <http://homepage.mac.com/sysop/PhotoAlbum3.html> accessed 20 July 2006.

Although the connector has ten contacts, the track-pad's flex cable indicates that only three conductors are in use (suggesting ADB communication). By testing the voltage at each of the contact points I came up with the following assumption.



[Figure 5-26] PowerBook G3 – internal ADB diagram, 2006.

I stripped the plug from an ADB mouse and attached the power (blue), data (red) and ground (black) leads as shown below.



[Figure 5-27] PowerBook G3 – testing the internal ADB connector, 2006.

With this connection the mouse is automatically recognised at start-up and functions as normal. The simple 'plug and play' qualities of the ADB system open it up to a wide variety of modding opportunities. One possibility that leaps to mind is the incorporation of my (now redundant) PowerBook track-pad into an external ADB keyboard (I'm currently typing on the Apple Keyboard II⁵ and the track-pad would look pretty neat in place of the numeric keyboard), but that's a mod for another day...

5/ Wikimedia Commons Apple Keyboard II image, http://commons.wikimedia.org/wiki/Image:Apple_Keyboard_II.jpg accessed 20 July 2006.

These objects were not collector's items in any conventional sense, I did not place them on display, they did not complete or extend an existing collection, and they did not offer a return on my investment. I was perpetuating this practice of consumption because it had become 'natural' to me. Occasionally I derived a degree of pleasure from the skilled and repetitive nature of the practice; at other times the activity felt like a chore. In general however the predominant feeling was one of absence or remove; the actions had become automatic. In this regard, I had become Foucault's 'docile body', constructed from atomised tasks that function within a larger productive machine. The activity, while essentially useless, proceeded via the logic of industrial labour.

Through privileging productive activity, practices of object modification readily adopt mechanisms and procedures associated with industrial wage-based labour. Here, as with Gelber's claim of DIY, the ideology of the workplace manifests itself in the form of productive leisure (Gelber, 1999, p. 2). Within practices of object modification it is possible to discern a strong 'work ethic' that demonstrates commitment and perseverance through repetition of action. While, at times, this mirroring of labour practices proceeds without conscious reflection (as above), the self-initiated, self-directed and self-reflexive nature of object modification generally means that such mechanisms do not go unchecked. Unlike wage-based labour, practices of object modification do not alienate the individual from the products of their labour. The modified object therefore becomes a means by which practitioners can objectify their individuality and reflect

on their relation to the world (Marx and Elster, 1986).

5.6 Transformative journeys

This research has involved a six-year engagement with the practice of object modification.

Due to my knowledge of the field my role could be described as observant participant (Kaminski, 2004), however this was not a role I could simply step into. Becoming an object modifier was a transformative process. In *A Hacker Manifesto*, McKenzie Wark states that 'Production producers not only the object of the production process but also the producer as subject' (2002). As I explored the limits of the object I also explored my own limits, developing new skills and new modes of behaviour. The challenge that practices of hacking, modding and DIY bring to society, and their ability to bring about previously unrealised configurations of thoughts and things, is not just directed outward to the world, but also turns inward towards the practitioner themselves. Practices of object modification challenge the individual to be all that they can be, to explore the limits of what is possible within their own lives. This is not, however, an exercise in self-improvement. The practice is not concerned with making a better person, or a better practitioner: it simply seeks difference. The practice seeks to distinguish what is from what might be, to abstract normalised relations and test new modes of being.

My engagement in this practice cannot be isolated to the research project. Temporally unfolding and spatially dispersed, the practice makes itself evident in my conversations with friends, my choice of leisure activities, my acts of con-

Interpreting mouse movement on the Mac (whether ADB or the more common USB variety) is possible via the application programming interface (API). I'm using Objective-C with Apple's Xcode development environment, so to detect mouse clicks I use the following handler:

```
- (void)mouseDown:(NSEvent *)theEvent
```

To check whether the left or right mouse button was pressed, you can interrogate the event for a type, such as:

```
if [theEvent type] == NSRightMouseDown {
    -- do something responding to a right click
}
```

I wanted to implement the standard Macintosh approach of allowing control-clicks to register as right mouse clicks, so my code looks like this:

```
- (void)mouseDown:(NSEvent *)theEvent
{
    if (([theEvent type] == NSRightMouseDown) ||
        ([theEvent modifierFlags] & NSControlKeyMask)) {
        [self rightClickAction];
    } else {
        [self leftClickAction];
    }
}
```

This code calls the handlers `rightClickAction` and `leftClickAction`, these navigate the user through the MP3 player's graphical user interface (GUI).

Responding to the mouse button wasn't crucial for my project (a similar response could be achieved by checking for key presses on the PowerBook's internal keyboard) but using a mouse allowed me to track the B&O's slider movement. I managed this with the help of a perforated metal strip I pulled from an old daisy-wheel printer.



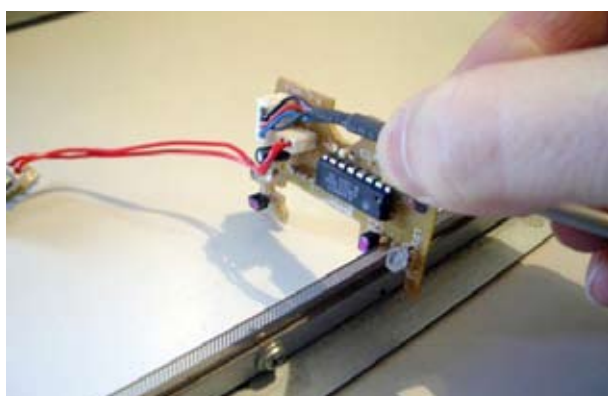
[Figure 5-28] Linear encoder, 2006.

It's a linear encoder, just like the mouse's encoder wheel except straight. I presume it was used by the printer to check print head movement.



[Figure 5-29] Linear encoder – detail, 2006.

Here's a close-up. The perforated strip alternately blocks or allows light to pass between an optical encoder's send and receive modules.



[Figure 5-30] Testing the linear encoder, 2006.

Here you can see the mouse's circuit board liberated from its enclosure and positioned on the strip so that left and right

sumption and my general belief structures.

Through this journey I have developed a deep familiarity with specific objects and processes. This experience is, however, different from being an expert in a particular field; my knowledge is materially and contextually sited within my own life. Practices of object modification engage the world in a very immediate and physical way. There is something primitive about this form of engagement in that it describes an intimate and responsive relationship between the individual and their surroundings.^{xxvi} Rather than being the antithesis of consumer practices this relationship runs through acts of consumption, residing at the localized point in time and space where individuals negotiate themselves into the world. Our ability to speak of this relationship as 'primitive' highlights the extent to which commercial entities have structured and obscured the individual's relationship to the material environment.

While my engagement with hacking and modifying practices produced an increased sense of personal agency, it also brought a degree of tension. As I hacked or modified an object I

xxvi. I use the term 'primitive' here in a similar sense to Colin St. John Wilson's description of architect Eileen Gray in *The Other Tradition of Modern Architecture*. Here Wilson claims Gray's practice has an 'intimacy, responsiveness and authenticity that we normally consider to be unique to those structures that we call 'primitive', that is to say, carried out by the inhabitants themselves, using only their own hands and the materials locally to hand, coping with the prevailing environment, developing any and every advantage from local topography, and erecting means of defence against any adverse conditions' (1995, p. 170).

became implicated in the object's functioning. If the object failed, then fixing it became my responsibility.^{xxvii} I do not feel the same duty of care with the objects I haven't opened, hacked or cracked. If they malfunction then this is largely someone else's problem – I will simply replace the object or get it repaired. When I began the research I found this increased responsibility stressful. As the research progressed, however, I became more comfortable with my role as repair technician. I attribute this shift to a growing familiarity with practices of hacking and modding and to a greater competency in the field. But my concerns have also been eased by the overwhelming success of these actions. The modification, maintenance and repair of objects has, in almost every case, been a relatively satisfying and productive experience. Not only am I now my own repair technician but I also find myself providing technical assistance to a growing number of friends and acquaintances.

5.7 Conclusion

From the examples given in this chapter it is clear that practices of object modification are not confined to material engagements but unfold through numerous discursive spaces and public acts. These various performances have an effect: they make a difference in people's lives through the formation of social and material relations. In being actively involved in the formation of these relations, individuals claim ownership over their environment, construct-

movements are registered by the optical encoder. Without further modification this set-up will move the on-screen mouse cursor. My program doesn't use the standard GUI of point and click: the mouse pointer is hidden when the program launches and instead the slider is used to navigate through the menu system (in much the same way as the iPod's click wheel).

In software, the movement of the mouse can be monitored through a mouse-moved event, however before this event will register you must tell the appropriate program window to watch for it. This is done through the method:

```
[aWindow setAcceptsMouseMovedEvents:YES]
```

Mouse-moved events are turned off by default because they generally occur so often that they can bog down the event queue. In the case of the B&O mod this shouldn't be a problem (and tracking slider movement in this way is far easier than using the tracking rectangles⁶ method suggested by Apple).

Once you've set the program window to watch for mouse-moved events you can respond to these events through the event handler:

```
- (void)mouseMoved:(NSEvent *)theEvent
```

The event that gets passed with the message contains a range of information on the mouse's position. I chose to get the mouse's delta movement because, unlike the mouse location, the mouse delta changes even when the mouse pointer is stuck against the edge of the screen. My code looks like this:

```
- (void)mouseMoved:(NSEvent *)theEvent
```

xxvii. I reflect on these feelings of responsibility in the blog post 'It lives (but only for one day)', <http://www.openobject.org/objectsinflux/?p=6> accessed 14 January 2011.

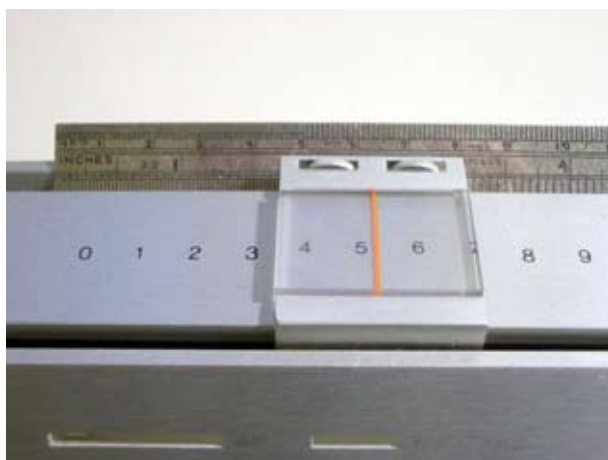
6/ Apple's Mouse Handling Pages, <http://developer.apple.com/documentation/Cocoa/Conceptual/BasicEventHandling/Tasks/HandlingMouseEvents.html>, accessed July 20, 2006.


```
{
  mouseY = mouseY + [theEvent deltaY];
  [self moveSelection:mouseDeltaY];
}
```

The code gets the vertical distance moved by the mouse and adds this to a variable containing the distance measured so far. This allows for cumulative movement to be recorded and assists in controlling the GUI response when scrolling through menus. The cumulative movement, mouseY, is passed to the handler, moveSelection, which in turn controls the menu selection.

Although this portion of the program interface is up and running, I have yet to mount the encoder strip and circuit board inside the B&O. I'm being held up by a lack of hardware.

The B&O's sliding control has two small wheels originally designed for fine-tuning radio stations.



[Figure 5-31] Bang and Olufson slider, 2006.

I plan to convert these wheels to buttons that will allow the user to navigate through the menu system, however I'm having trouble finding micro-switches small enough for the job. If anyone out there knows of a suitable momentary switch (around 3 mm x 4 mm, and preferably in Australia) please let me know.

ing it in a manner that reflects their own beliefs and desires.^{xxviii} This production, however, is not without constraints; the space of consumption presents obstacles that structure consumer production and limit the modes of representation it may take. In the following chapter I will explore these obstacles by examining the strategies employed by commercial institutions and the tactics by which consumers resist or manipulate the imposed order.

xxviii. Similar in ethos to DIY activism, practices of object modification enact change within the practitioner's own life through direct action.

SONY

OPR/BATT

SPORTS
WALKMAN FM/AM



6. Strategies of Control and Tactics of Use

6.1 Introduction

In the early years of the 20th century, as automobiles became more affordable, automotive manufacturers began expanding their sales into rural America. Farmers, many of whom had previous experience with stationary engines, found in the automobile an endlessly adaptive machine. By jacking up the rear wheels farm workers were able to drive corn shellers, water pumps, hay balers, wood saws and washing machines; if the rear seat was removed the automobile could be used to cart produce and supplies; and by fitting a range of accessories it could be adapted for light tractor work. In their study on 'The Social Construction of the Automobile in the Rural United States', Ronald Kline and Trevor Pinch find a high degree of 'interpretative flexibility' in the automobile's initial introduction and use, with radically different meanings being developed for the automobile within different social groups (1996). Kline and Pinch note that 'many automobile manufacturers counteracted, rather than supported, the interpretative flexibility of the rural auto in the early days of the industry' and sought to stabilize the automobile's meaning in line with their own commercial interests (1996, p. 784).

This chapter will explore the control mechanisms used by manufacturers to influence consumer behavior and limit an artefact's interpretative flexibility. Beginning with a brief exploration of Kline and Pinch's study of the automobile, the text will then turn its attention to specific acts of commercial control within contemporary society. From these

[Figure 6-1 – facing page] RetroPod iPod case by John Young, 2004. Photograph Young.



[Figure 6-2]
Ford Model-T automobile used to
power a small saw mill.
Photograph from the Collections of
The Henry Ford.

accounts, the highly contested nature of object use becomes apparent. The producer's ability to structure consumer behavior, and the actions taken by consumers to escape this control, positions the object as a site of struggle and highlights a political dimension within practices of consumption. The chapter concludes with an examination of emerging consumer resistance and collective action that threatens the authority of established commercial institutions.

6.2 Interpretative flexibility

It is clear from Kline and Pinch's study that practices of modification were widespread amongst automobile owners, particularly farmers, at the beginning of the 20th century. US census data from the 1920s indicates that the automobile was far and away the most popular form of inanimate power on the farm, and media reports of vehicle modifications date back to 1903 (Kline & Pinch, 1996). While farmers gave positive accounts of the modification process, automobile manufacturers were generally less enthusiastic. In a survey conducted by the *Rural New Yorker* in 1906, six out of seven auto manufacturers' adamantly opposed the use of the automobile as a stationary power source, claiming such practices could damage the car's engine or differential gear (Kline & Pinch, 1996, p. 784). The *Rural New Yorker* aligned itself with the manufacturers position, advising farmers to purchase dedicated stationary engines (such as those regularly advertised in its pages). This stance was given further support through journal articles written by agricultural engineers who provided expert advice warning of the danger posed by homemade conversions. In 1919, however, when conversion kits designed to 'safely' harness power from the cars' crankshafts or rear axles became widely available, and widely advertised within the journal, the *Rural New Yorker* changed its editorial stance and began recommending such kits (Kline & Pinch, 1996).

While journals such as the *Rural New Yorker* publicly supported commercially available conversion kits, manufacturers of farm vehicles generally adopted a more critical position. Quoted in a 1918 edition of *Tractor World*, the advertising manager for the La Cross Tractor Com-

pany claimed that 'the jacking up of an automobile and attaching a belt to one of the hind wheels to drive a grindstone or cream separator, is simply ridiculous and should not be given serious consideration by anyone.' While, in the same year, the American Tractor Association, a powerful trade group, attempted to combat the threat of tractor conversion kits by lobbying the War Industries Board to 'prohibit entirely the manufacture of attachments for converting automobile and motor trucks into tractors for farm use' (Kline and Pinch, 1996).

The Ford Motor Company presents a particularly interesting position with respect to the consumer modification of the early automobile. One of the earliest published photographs of a car being used as a stationary power source shows Henry Ford sawing wood with a new Model-A Ford. The use of imagery such as this formed a consistent thread within the company's early media profile. In 1908 Ford's own journal, the *Ford Times*, stated that 'with a little ingenuity the engine can be made to run the cream separator, saw the wood, or pull a trailer loaded with farm produce or housing supplies'. Likewise, Ford's advertising material for the Model-T presented it as the 'universal car', supporting this claim with stories of how farmers had harnessed the car to complete their chores (Kline and Pinch, 1996).

Ford was, however, less tolerant of consumer modifications that adapted the automobile for use as a truck or light tractor. In 1916 Ford told its dealers not to convert 'Ford cars into trucks or other make-shifts not recommended or sanctioned by us', and that making such alterations would cost them their dealership. In the following year Ford advised dealers not to sell truck conversion kits as the company had just introduced a one-ton truck to the market, and in 1918 Ford announced that owners would void their warranty by altering their cars in this manner (Kline and Pinch, 1996). Ford's actions may be understood as a means to increase sales of its newly introduced one-ton truck and Fordson tractor (both introduced in 1917),¹ and while many Ford dealers regarded the automobile as a multipurpose vehicle, their contractual relationship with the Ford Motor Company forced them to abide by Ford's more limited interpretation.

The interpretative flexibility evident in early automobile use helped establish new markets and bring about technological change. Kline

1/ Although the Ford one-ton truck (Model-TT) was introduced in 1917 it was initially only available in chassis form, and buyers were required to provide their own truck body (cab and tray). It was not until 1924-25 that Ford started mass-producing truck bodies.

2/ Practices of consumption have continued to be hugely influential on both the automobile's social meaning and its market development. As David Nicholas Lucsko illustrates in his doctoral thesis, car enthusiasts, particularly hot rodders, continued to challenge the perceived norms of automobile use and indeed end-user interpretative flexibility has remained strong throughout the history of the automobile (1998).

3/ Discrediting alternative products or practices sometimes involves the dissemination of negative, yet vague and unsubstantiated, accounts. This strategy has come to be known as 'Fear, uncertainty and doubt' (FUD), a term coined by ex-IBM employee Gene Amdahl to describe an IBM marketing technique when speaking of competitors' personal computer products. FUD is not reliant on relative technical merits, but rather attempts to persuade consumers that 'bad things' will happen if they stray from the manufacturers' recommended paths. For further details see Eric S. Raymond, 'The Jargon File: FUD', <http://www.catb.org/~esr/jargon/html/F/FUD.html> accessed 10 February 2011.

and Pinch claim that this interpretative flexibility did not last forever and by the early 1950s it had disappeared; 'closure' had occurred 'and farm people had stopped using their autos for grinding their grain, plowing their fields, or carrying their produce to town' (1996, p. 795). While Kline and Pinch state that 'closure' need not be final, they do not believe that every modification of the car counts as a reappearance of interpretative flexibility. Such an understanding poses a problem for my own research. Throughout this study I have been repeatedly confronted by the diversity and depth of practices of consumer modification, and by the consumer's ability to find degrees of interpretative flexibility, even within heavily structured consumer experiences. Although these diverse modes of consumption do not always influence the technology that is brought to market, the possibility for divergent use appears integral to the meanings we form of objects and, consequently, our construction of social reality.²

Kline and Pinch are largely concerned with demonstrating how social processes influence 'the very content of technology' (Pinch, 1996). However, in focusing on technological change, Kline and Pinch equate market stabilization with 'closure' and hence 'interpretative flexibility' is marginalized, its presence validated only when it can be seen to impact on the marketplace. This approach does not adequately account for the diversity of consumer practices evident in this research or for the numerous commercial strategies that are deployed to suppress divergent consumer use. For this study I propose that interpretative flexibility be regarded as a permanent condition of the object and that stabilisation is effected not through closure, but through a sustained deployment of control mechanisms.

6.3 Control mechanisms

From the various narratives that emerge in Kline and Pinch's study it is possible to identify five general control mechanisms by which manufacturers sought to limit the interpretative flexibility of the automobile. These control mechanisms are as follows:

- Control through representations of use: Through the use of various media, including newspapers and trade journals, manufacturers sought to promote and position the automobile and define its 'proper' use. By adopting an authoritarian voice and using 'ex-

pert' advice to support their claims, manufacturers cast alternative modes of uses as both socially inappropriate and damaging to the automobile.³

- Contractual control: The Ford Motor Company used its contractual relationship with Ford distributors to limit the availability of conversion kits. In addition to this, by identifying specific uses as violations of the warranty and service agreement, Ford effectively confined users to its prescribed modes of use.
- Restricted product ecology:⁴ Through control of the automobile's distribution and sale, the Ford Motor Company could establish a restricted ecology of products around the automobile and limit consumer exposure to competing technologies and divergent uses.
- State regulation: By lobbying government regulators, manufacturers and their representatives (specifically the American Tractor Association), attempted to introduce laws that favored their interpretation of object use and prohibited or stifled alternative developments.
- Control through design: The physical qualities of the automobile directly affected the affordances offered the user, and hence played a major role in determining the uses to which the automobile was put. The highly adaptable nature of the Ford Model-T design encouraged diverse practices of use. Greater complexity of parts, use of proprietary components, and restricted access to internal workings may all be deployed as design mechanisms to limit interpretative flexibility. Control through design may also be achieved by introducing new products to the market that compete with the functionality offered by divergent use. The introduction of the Ford one-ton truck and Fordson tractor are examples of this form of control through design.

Adopting the terminology of de Certeau, we may describe these control mechanisms as 'strategies' that seek to create places in conformity with 'abstract models' (de Certeau, 1984, p. 29). Operating from a position of power, the Ford Motor Company and other manufacturers were able to claim authority over the space that constituted automobile use and dictate the 'natural' conditions of this space. This authority far exceeds any form of ownership granted the consumer through the act of purchase, for while the consumer may gain possession of the object, the manufacturer continues to author the object even as it sits

4/ I use the term 'product ecology' here to describe the collection of products, systems and people that shape a consumer's experience of a specific product. This understanding follows from Jodi Forlizzi's use of the term within the field of human-computer interaction (HCI) (Forlizzi, 2007, 2008; Forlizzi and Battarbee, 2004).



[Figure 6-3]
Circuit diagram attached to the rear of
a 1980s JVC television, photo 2005.
Image is author's own.

within the consumer's hands. While automobile use emerged as a contested domain, it was not a level playing field. Through the deployment of control mechanisms manufactures positioned the automobile in line with their commercial models and established divergent use as deviant or disruptive to the 'proper' functioning of the automobile.

Shifting our focus to the present day it is possible to discern a sixth control mechanism

operating within contemporary society, that is, the control of information. Through carefully structuring the information made available to consumers, manufacturers are able to limit consumer behavior to a set of documented and authorized paths. Within recent years this form of control has become particularly prominent.

Until quite recently the television in my lounge room was a JVC model 7865AU built in the 1980s. Attached to the back of the television, housed inside a small plastic pouch, was a circuit diagram documenting the television's inner workings. This documentation was intended to provide repair technicians with all the necessary information required for diagnosis and repair of the unit. Here the object and the technical description of the object are given together. The television, adrift in the world, carried with it information on its own construction. This information gave the object an independence from its place of production. Such an approach was once common practice: the underside of the BeoCenter 4500 used in the B&O MP3 Mac Mod was printed with detailed diagnosis and repair information; likewise, the first personal computers from Apple Computer Inc., the Apple 1 released in 1976 and the Apple II released in 1978, shipped with technical descriptions of the systems' processors and circuit designs. In the 30 years since, the practice of providing detailed technical documentation has gone from commonplace to virtually non-existent. Instead of circuit information attached to the rear of a modern device you are now far more likely to find a sticker stating, 'no user-serviceable parts inside'. The products of late capitalist society are no longer adrift in the world; they are tethered to their manufacturers through a physical dependency based on information control.

6.4 Apple repair manuals

While this reduction in technical information may be understood as a cost-cutting measure or a simplification of the user experience, such explanations do not account for the active suppression of technical material. This form of information control was evident during the B&O MP3 Mac Mod project. In order to modify the Apple Macintosh PowerBook used in the project, I required detailed information about the computer's inner workings. I found this information in an Apple repair and service manual (Apple Computer Inc., 2003), however, I did not obtain this manual from Apple. The manual, along with numerous other Apple publications, was available as a free download from a third-party website established by freelance computer repair technician Marion Bates.⁵ In a note published on the website, Bates discusses her motivations for making this information public:

*'I fundamentally think that you should have every right to tinker with the thing you paid for – the infamous quote comes to mind, "Would you buy a car with the hood welded shut?" And I also derive an entirely selfish pleasure from helping people, especially with something neat like resurrecting an old Mac. I've formed friendships with a handful of people who've contacted me through the site, and that's the best part of this.'*⁶

In June of 2006 Marion Bates received an email from Apple's lawyers demanding that the Apple content be 'immediately removed' from the site.⁷ Bates complied with this demand; Apple had successfully restricted access to the technical details of its products and limited the possibilities for consumer action. Without access to this information many of the operations performed as part of the B&O MP3 Mac Mod project would have been impossible. As Lawrence Lessig notes in his book *Free Culture*, the heightened technical complexity of contemporary products means that in many cases the consumer can no longer simply look at an object in order to discover how it works (2004).⁸ With increased control of product information, this situation is compounded. Product service and repair is removed from the consumer's reach and confined to authorized repair centers.

Apple's actions highlight the controlled nature of consumption and indicate that production and consumption cannot be thought of as two

5/ <http://www.applerepairmanuals.com> accessed 5 February 2011.

6/ <http://www.applerepairmanuals.com/my-note.html> accessed 5 February 2011. In asking the question 'would you buy a car with the hood welded shut?' Marion Bates is quoting a much-used statement from the FOSS movement that originated with Red Hat CEO Bob Young in which he compared the Microsoft Windows operating system to 'a car with its hood welded shut' (Trott, 1999).

7/ Excerpt taken from Marion Bates website. <http://www.applerepairmanuals.com/apple-letter.php> accessed 5 February 2011.

8/ Brandes, Stich and Wender also note that product complexity is a limiting factor of object reuse: 'with increasing complexity, objects provide fewer opportunities for redefinitions of use. This is particularly true for the 'technological wonders' of modern society' (2009, p. 141).



[Figure 6-4]
RetroPod iPod case by John Young,
2004. Photograph Young.

6.5 RetroPod

In 2003 John Young, a web designer from Westchester, USA, modified a 1980s Sony Walkman cassette player for use as an iPod protective case. Young decided to start small-scale commercial production of the Walkman modification. After conducting a number of experiments, Young developed an easy manufacturing technique that he could carry out in his garage with a car jack and a specially designed steel die. In July of 2004, Young started selling the iPod cases online under the name RetroPod. Six weeks later Young received a letter from Sony's lawyers demanding he stop selling the modified Walkman products. An excerpt from the letter follows:

'Sony recently learned that you are selling a case for carrying an iPod personal stereo that is made from a WALKMAN tape player. The product is being offered at your website at www.retropod.com.

Your use of casings for such a purpose is a clear infringement of the SONY and WALKMAN marks because it is deceptive. Consumers likely will be misled and deceived into believing that Sony is somehow connected with the iPod personal stereo when in fact it is not. Moreover, they will be misled into thinking that Sony is backward in its design of products and is going away from miniaturization, as the size of the tape player housing is quite large by today's standards.

Accordingly, we demand on behalf of Sony that you immediately cease and desist from selling, or offering to sell or distributing your Retro-pod product...'⁹

John Young stopped production of the RetroPod. It is debatable whether Sony's claims would be upheld in a court of law, however, the

separate domains. Consumption does not lie beyond the sphere of production, but rather is given within the producer's field of dominance; it is that which can be encircled and inscribed by the producer. Control mechanisms define what is allowable within this field and limit an individual's ability to move beyond it. In the following example we see the difficulty of moving beyond a position of consumption into one of production.

9/ Excerpt taken from John Young's website. <http://www.retropod.com/> accessed 7 February 2011.

legality of this claim is largely irrelevant. Control is exerted not via legal proceedings, but through the threat of these proceedings. The cost of legal action is generally far beyond the financial means of the individual, and hence such action rarely progresses to the courts. Young didn't stop because Sony's claim was justifiable or right – he stopped because he had very little choice.

Even though the Walkman Young modified left the Sony factory over 20 years ago it remained the domain of the Sony Corporation and therefore Young was unable to claim ownership over his own creative production. While Sony couldn't prevent Young from developing the RetroPod for personal use, or from speaking publicly about his creation, they could stop him from moving beyond his designated role as consumer.

6.6 GI Joe

While Young's actions were limited by the commercial nature of his endeavor, consumer production need not have a commercial outcome for it to fall under this form of control. The expansive scope of copyright law means that the reuse of text or imagery within a digital environment is generally prohibited regardless of whether it is commercially motivated. In 2003 a group of computer game enthusiasts released a modification of Electronic Arts multiplayer game 'Battlefield 1942' that incorporated game elements based on the popular Hasbro toy line, GI Joe (Nieborg, 2005; Postigo, 2008). The 'GI Joe' mod had strong nostalgic appeal, members of the mod team and the broader gaming community having grown up with the action figures and animated television series. In developing the 3D game models, modders purchased official GI Joe merchandise such as videos, toys and comics (Postigo, 2008). Shortly after the mod's release, lawyers representing Hasbro contacted the 'GI Joe' mod team and demanded that work on the 'GI Joe' game modification cease. While the mod team attempted to negotiate with Hasbro for licensing terms, these negotiations were unsuccessful and the mod was abandoned (Postigo, 2008). Even though the 'GI Joe' mod team had no intention of profiting from their creative work, their ability



[Figure 6-5]
GI Joe computer model for game mod. Model and image by KMP, <http://www.k-m-p.com/?p=64> accessed 3 March 2011.

to reuse the imagery from their childhood was limited by copyright law that positioned their creative play as an infringement of Hasbro's intellectual property rights.

Within the digital environment, a world where every act produces a copy, the user has never been more effectively controlled (Lessig, 2004). As the boundaries to this world collapse and advanced technology makes its way into everyday products, a new era of product control has emerged. Objects are now empowered with technology that can effectively enforce a manufacturer's intellectual property rights. Digital Rights Management (DRM) and various technical protection measures encrypt content and prevent unauthorized use, ensuring consumers remain within the prescribed paths of consumption.

6.7 Sony Aibo

In the book *Free Culture*, Lawrence Lessig tells a story in which the owner of a robotic toy dog, the Sony Aibo, taught their dog to dance jazz. This user hacked the Aibo software so that new instructions could be uploaded to the Aibo product to produce new combinations of robotic movement. The user established a website, aibopet.com, to share their experiences and encourage others to teach their Aibo dog to dance. In October 2001 Sony sent a 'cease and desist' letter to aibopet.com demanding that the site stop distributing code related to the Aibo hack. In the letter Sony states: 'Your site contains information providing the means to circumvent AIBO-ware's copy protection protocol constituting a violation of the anti-circumvention provisions of the Digital Millennium Copyright Act' (Lessig, 2004).

10/ The DMCA was adopted by Australia through the Australia-United States Free-Trade Agreement 2004 (AUFITA). For discussion of the AUFITA's impact on Australian copyright law see First Monday, 'Robbery under arms: Copyright law and the Australian-United States Free Trade Agreement' (Rimmer, 2006).

11/ For an extended list of conflicts arising from the DMCA see the Chilling Effects Clearinghouse, a joint project of the Electronic Frontier Foundation and Harvard, Stanford, Berkeley, University of San Francisco, University of Maine, George Washington School of Law, and Santa Clara University School of Law clinics. <http://www.chillingeffects.org/> accessed 10 February 2011.

No longer simply a mechanism for regulating the copying and distribution of creative content, copyright law has become an effective tool for structuring product use. Provisions within the United States' Digital Millennium Copyright Act 1998 (DMCA) make the circumvention of technical protection measures illegal regardless of the reason for such circumvention.¹⁰ As Lessig argues, the DMCA makes the Aibo hack illegal even though it would be regarded as a 'fair use' of the Aibo product under copyright law (2004, p. 157).

While there are many examples of manufacturers threatening individuals with legal action,¹¹ control of use is generally not obtained

through direct action but rather through the careful structuring of the consumer realm. Sony's action against aibopet.com should be understood not as an attack on an individual but as part of a broad strategy to control the Aibo user environment. In their attempt to structure product use Sony used a number of control mechanisms. In shutting down the aibopet.com website Sony sought to control representation of the Aibo product by limiting the visibility of this divergent use. Through contractual control mechanisms such as product warranties and End User License Agreements (EULA),¹² Sony deterred users from carrying out unauthorized product modifications. State regulation, specifically the anti-circumvention provisions given within the DMCA, allowed Sony to claim this divergent use as illegal. In the design of the Aibo product Sony limited the functionality of the robot to a defined set of movements and employed technical protection measures to prevent users from altering or adding to these movements. And finally, by forcing the removal of instructions and software pertaining to the Aibo modification Sony effectively controlled the information available to consumers and limited the possible paths of engagement.

Through this combination of control mechanisms Sony sought to limit the interpretative flexibility of the Aibo product, however, their use of direct legal action against aibopet.com angered many in the Aibo user community. Sony had underestimated the importance of this site to Aibo customers. Richard Walkus, an Aibo owner stated:

'Aibo is an exciting toy, but Aibopet's enhancements kept the excitement going ... He's made tools to see what mood Aibo was in, or set it in different life stages, or have better wireless communications. There are tools to see in real time what Aibo sees, and vital signs, emotions, mood, voice recognition. Those were enhancements riding on top of Sony's Aibo that Aibopet created.' (Cited in Manjoo, 2001.)

Disgruntled Aibo owners threatened to boycott Sony; in response, Sony released a number of Aibo programming tools for non-commercial use. The release of official programming tools had a similar effect



[Figure 6-6]
Sony Aibo, 2008.
Photograph Schockwellenreiter.

12/ An End User License Agreement (EULA) is a contract between a producer/distributor and a user/consumer of a product or service. EULAs are commonly used for software and digitally distributed media and often grant special copyright exemptions to users, such as allowing them to install and run software or load media onto a specified number of devices, where such actions may normally constitute a violation of copyright law. In addition to this, EULAs may be employed by producers to expand their control of use beyond that given within the copyright act.



[Figure 6-7]
Pentalobe screws on Apple iPhone
casing, 2011.
Image is author's own.

on the consumer environment as Ford's introduction of the one-ton truck and Fordson tractor: the new products competed with the functionality offered by divergent use and limited the appeal of unauthorized practices.

6.8 Pentalobe screws

While technical protection measures are generally used to limit access to software and media content, a product's materiality – its form, components, fixings and fasteners – often act to restrict physical access to the object. This form

of control is particularly prevalent in contemporary electronic devices such as the Apple iPod personal music player. In designing the iPod, Apple eliminated all visible signs of construction – to the consumer the device appears as a solid, sealed unit. It may be argued that the addition of screws or similar fasteners to the iPod's external facade would disrupt the product's clean lines and minimal design. However true this may be, it should also be acknowledged that a secondary function of the design is to limit user access to the internal workings of the device.

Evidence that Apple adopts design strategies that deliberately restrict consumer access may be found with the recently released iPhone 4. Initially the iPhone 4 was released with two small Phillips – head screws located at the base of the phone; undoing these screws gave access to the iPhone's internal components. In more recent versions of the phone the Phillips – head screws have been replaced with pentalobe screws. The pentalobe screw has a tamper-resistant head that requires a specially shaped driver not readily available in the marketplace. Consumer reports indicate that when original iPhone 4 products are taken to Apple for repair, the existing Phillips – head screws are replaced with pentalobe screws (Foresman, 2011).

Through the material construction of the iPod and the use of pentalobe screws, Apple effectively limits the possibilities for DIY maintenance and repair, making procedures such as battery replacement a specialized task. As with technical protection measures, the use of tamper-resistant fasteners and restrictive enclosure design locks consumers

out of the products they own and locks them into authorized maintenance and repair channels. When a product fails, the consumer often has little choice but to follow the manufacturer's prescribed replacement or repair plan. Of course, not all consumers are perturbed by these control measures; after all, nothing gets a hacker's attention like a locked door.

6.9 iPodLinux

Nils Schneider (screen name nilss) was part of the 'iPodLinux' development team, a group of hobbyists who had set themselves the task of installing the Linux open source operating system onto the iPod personal music player.¹³ The team had been successful in getting Linux to run on the first three generations of iPod but the fourth – generation iPod was proving difficult. The issue concerned the bootloader, a small piece of software that is loaded from flash memory when the iPod starts up (boots) and which, in turn, loads the more complex iPod operating system from the iPod's hard drive. Understanding the bootloader was essential to understanding how to gain access to the hard drive, display, clickwheel and other hardware. This had been achieved for previous iPods by extracting the bootloader code from the iPod firmware image, a file distributed by Apple so that users could update and restore their iPods. With the release of the fourth generation iPod this was no longer possible because for the first time Apple had encrypted the bootloader code contained within the firmware image. In order to proceed, the iPodLinux developers needed access to an unencrypted version of the new bootloader. One place they could find this was in the flash memory chip of a running iPod (the iPod decrypts the bootloader before running it). The question was, how do you read a file from the iPod's memory when you have no idea how that file is controlling the iPod's hardware? Without access to the iPod's screen or serial ports there seemed to be no way to get the bootloader code out of the iPod.

Shortly after Christmas 2004 Schneider thought he may have a solution. He had been experimenting with a piece of code given to him by Bernard Leach (screen name leachbj), another member of the



[Figure 6-8]

Insulated recording studio (cardboard box) by Nils Schneider, 2004.
Photograph Schneider.

13/ <http://www.ipodlinux.org/> accessed 22 May 2008.



[Figure 6-9]
Apple iPod running iPodLinux, 2008.
Image is author's own.

iPodLinux development team. When run on the iPod, the code caused the iPod's piezo-electric transducer (the device that produces the audible clicking noise when the iPod's buttons are pressed) to make a 'squeaking' sound. Schneider discovered that by varying some of the code's parameters he was able to produce a range of different sounds. It occurred to Schneider that he may be able to use these sounds to transfer data. Selecting two distinctly different sounds, Schneider wrote a program that would translate the binary data stored in

the iPod's memory into a series of clicks and beeps that could be output through the transducer. Then, with the help of fellow developer David Carne (screen name Busonerd), he constructed the signal analysis software needed to convert the audio back into binary data. It took eight hours to dump the entire 64kb of data from the iPod's flash memory out the piezoelectric transducer. Schneider constructed a small recording studio from a cardboard box in order to limit external noise. The resultant recording was then input into the signal analysis software. After a number of failed attempts, Schneider succeeded in reconstructing the data from the iPod's memory. Using this data the iPodLinux development team were able to reverse – engineer the bootloader code and successfully install Linux on the fourth generation iPod.¹⁴

14/ This narrative was pieced together from numerous posts on the iPodLinux forum, <http://ipodlinux.org/forums/> accessed 21 May 2008, and an account written by Nils Schneider available through the Internet Archive, <http://web.archive.org/web/20070601200428/http://www.ipodlinux.org/stories/piezo/index.html> accessed 21 May 2008.

As de Certeau claims in *The Practice of Everyday Life*: 'there is a certain art of placing one's blows, a pleasure in getting around the rules of a constraining space' (1984, p. 18). This 'pleasure' is clearly evident in Nils Schneider's actions. For Schneider, and the other members of the iPodLinux development team, the iPod is a place of experimentation where iPod use becomes a highly complex form of play, an exploration of 'the limits of what is possible' (Stallman, 2002). iPodLinux team member Bernard Leach explains that the project is partly for fun but it also has a more serious purpose: 'It changes the iPod from a consumer device, where the manufacturer sets the rules about what it will and won't do, into a general purpose device' (Knight, 2005).

6.10 Tactics of use

Operating within a highly controlled environment, hackers and modders are forced to adopt a ‘tactical’ approach. Where commercial strategies are capable of producing, tabulating and imposing spaces, ‘tactics’ can only use, manipulate and divert these spaces. As de Certeau states, tactics ‘remain dependent upon the possibilities offered by circumstance’ but they ‘do not obey the law of the place, for they are not defined or identified by it’ (1984, p. 29). Like the practice of guerilla warfare, the tactic resists from within. Unable to claim a space as their own, the user traverses the consumer environment, negotiating their own path through the dominant logic of normalized use.

In the text ‘de Certeau and Foucault: Tactics and Strategic Essentialism’, Claire Colebrook claims that ‘a tactic works metaphorically: rather than returning the logic to some ground, it thinks the logic from a different point of view’ (2001, p. 546). Although the tactic cannot hope to defeat the system it inhabits, it is not contiguous with this system. Through the gap offered by metaphor, the tactic figures the world differently; it plays the game, but to a different end. Following are four examples that may be regarded as tactical responses to dominant models:

- A popular hobbyist t-shirt produced by O’Reilly Media proclaims ‘Void your warranty, violate a user agreement, fry a circuit, blow a fuse, poke an eye out...’¹⁵ Here, the dominant logic that positions hacking and modding as dangerous and foolish is turned on its head: ‘dangerous and foolish’ are claimed as positive traits.
- As football crowds disrupt Cliff Wins’s private life, Wins’s alter – ego Maduncle makes a game of the situation, figuring an alternate world of zombies and heroes. Action that, in another light, may be confrontational becomes playful.¹⁶
- While Apple Inc. regards the redistribution of its repair manuals as a form of theft, Marion Bates establishes a website that positions this act as a gift.
- And, in possibly the most dramatic and wide-reaching example,



[Figure 6-10]

Text from Make magazine t-shirt, 2010. Image Make Media.

15/ Similar sentiments are prevalent in online discussions where user signatures include taglines such as ‘If it ain’t broke, Mod it till it is’. <http://www.bp6.com/board/viewtopic.php?t=1471> accessed 15 February 2011.

16/ See Chapter 5: Telling Stories.



[Figure 6-11]
Street advertisement for iSOP,
Melbourne, Australia, 2006.
Image is author's own.

17/ As Steven Weber states in *The Success of Open Source*, unlike proprietary software, 'property in open source is configured fundamentally around the right to distribute, not the right to exclude' (2004). Free and Open Source Software (FOSS) does not oppose copyright law, but rather rethinks it from within, deploying the copyright mechanism but not the overarching logic. Strictly speaking, the FSF's ability to claim a space and dictate the rules of that space means that its actions cannot be thought of as tactical in de Certeau's sense of the term. However, opening up this space involved a tactical engagement with the dominant logic of copyright law and the re-figuring of this law into an alternative domain.

the Free Software Foundation (FSF) rethinks copyright law not as a system for securing property rights but as a mechanism by which property rights may be figured as communal and social.¹⁷

Through these acts, hackers and modders make the dominant logic 'function in another register' (de Certeau, 1984, p. xxi). And, as Colebrook states, 'the very system of our logic, the exhaustive map of the real, is 'opened' to a vacillation, doubling, or hesitancy' (2001, p. 558). While these acts of resistance are often transitory, they are not without effect. In their 'perversion' of the dominant logic, tactics expose the forces through which this logic is established and maintained. Colebrook explains the situation as follows:

'Strategy is a logic or calculus of the proper. Each point in the whole has its proper term and name without difference, movement or ambiguity. Indeed strategy occurs only when the event of naming and ordering this space as a place is forgotten. This is where tactic and memory as metaphysical intervene. Here a doubling occurs that does not take us to another place, but repeats the place already given and in so doing reveals the way in which place is generated from space, the way in which the literal is given through figure' (2001).

In the distinction made here between 'space' and 'place' we see the normalizing force of strategies and the disruptive potential of the tactic. The tactic challenges an essentialism within normalized social relations that positions these relations (and, hence, the dominant logic) as 'natural'. Through a tactical reconfiguration of place, normalised relations are revealed as constructs of the dominant commercial, state, educational or social institutions.

6.11 iPod Social Outreach Program

In *The Practice of Everyday Life* de Certeau claims that consumers are a 'marginalised majority'; unable to claim a space as their own, consumers' activity remains 'unsigned, unreadable, and unsymbolised' (1984, p. xvii). Through my study of consumer production two things have become clear. Firstly, there is little doubt that consumers

are marginalised by the contemporary capitalist economy: producers actively limit consumer behaviour and often act to suppress practices of divergent use. Secondly, despite the controlled environment, consumers find a space to talk about the things they consume. This is particularly evident in cases of divergent use. These two conditions present object use as a highly contested domain. While consumers occupy a subjugated position, their actions are not unsigned, unreadable or unsymbolised. As consumers speak publicly about their actions they become visible to commercial institutions and therefore identifiable as targets or threats. While producers often act to limit or capture this divergent consumer agency,¹⁸ visibility also brings with it the possibility of communal action.



[Figure 6-12]
iSOP repair desk, Uplands gallery,
Melbourne, Australia, 2006.
Image is author's own.

The final project developed for this research explores communal action within practices of DIY repair. Taking the Apple iPod personal music player as its focus this project instigated a free public repair service under the title iPod Social Outreach Program (iSOP). Sited within a contemporary art gallery in a busy shopping precinct in Melbourne, Australia, iSOP accepted broken iPods for repair from members of the general public.

iSOP ran for four weeks, during which time the project took in a total of 28 iPods for repair. Participants in the project were informed that repairs were being undertaken by myself, an untrained individual with no professional qualifications or prior experience in iPod repair. The repair process was guided by user-generated content freely available on the Internet. In attempting repairs, I sought to identify faulty components within the iPod and, where possible, repair these components; iSOP did not source or provide replacement parts. Of the 28 iPods submitted for repair, 16 were returned to their owners in working condition, ten were damaged beyond my resources or abilities, and two did not exhibit any recognizable faults.

18/ The commercialisation of consumer production is particularly evident in the computer game industry, see for example Banks and Humphreys, 2008; Flowers, 2008; Kücklich, 2005; Postigo, 2008.



[Figure 6-13]
Opening the iPod with a guitar pick,
2006.
Image is author's own.

While the iPod has enjoyed widespread commercial success and praise for its innovative user interface it has also attracted criticism from a number of quarters. In 2006 the Australian *Choice Magazine* listed the iPod amongst the top ten worst consumer products, citing cracked screens, faulty batteries, problems with sound reproduction and restricted warranty repairs (Gibson, 2006). In many respects the iPod is typical of current trends in consumer electronics design, presenting the following key features:

- Continuous production: Regular software updates keep the iPod in a continual state of production.
- No user-serviceable part: To the average user the iPod is a sealed unit with no visible indication of how it may be opened. Attempting to open the iPod will void the consumer's warranty agreement.
- Extended user environment: The iPod is positioned within an ecosystem of supporting software that structures user behaviour and links users to Apple's commercial products and services.
- Closed source software: The iPod operating system is proprietary, closed source code that has been encrypted to deter third party modification or hacking.
- High repair cost: Cost of repair outside the warranty period is often comparable to iPod replacement costs.
- Restricted product information: Apple publishes virtually no information on the internal workings of the iPod.
- Restricted access to replacement parts: Apple does not sell replacement parts to the general public.

Taken together, these factors present a highly structured user environment. Whilst this may contribute to a coherent user experience it can also prove disempowering for the consumer. This is particularly evident when the user is faced with product failure. Dissatisfied with the alternatives, some users choose to attempt their own repairs.

6.12 User-generated content

In the absence of official Apple documentation, a large amount of information published on iPod repair procedures is user-generated. This information is a Internet based and often takes the form of how-to pages that detail a specific act of repair such as opening the device or reformatting the iPod's hard drive.¹⁹ iSOP participated in this field of user-generated content by developing a public blog site which links to existing documentation and gives detailed accounts of the various repair processes undertaken during the project.²⁰ Participants in the project and members of the public were able to follow the repair process as it unfolded. In addition to this the blog remains online as a public resource.



[Figure 6-14]
Fixing an iPod suffice with coloured ribbon cable, 2006.
Image is author's own.

I found that many of the iPods submitted to iSOP could be fixed with relatively simple procedures. Of the 16 iPods that were successfully repaired, ten were restored to working condition through a simple process of disassembly, cleaning and reassembly. The success of this process prompted me to apply it as a matter of course regardless of the iPod's particular symptoms. In many cases the repair process succeeded without diagnosis of a specific fault or any deep understanding of the underlying cause. Aside from the technical challenge of opening the iPod, this repair process required minimal skill or specialist knowledge and, as such, it may be regarded as a highly suitable and effective user repair option.

When this simple procedure failed to repair the iPod more detailed research was generally required. In these circumstances the benefit of having multiple identical devices on hand quickly became apparent. By swapping components between a defective iPod and a functioning device, faults could be quickly traced to specific parts. Once the faulty part had been identified it was sometimes possible to repair the component or replace it with a part from another iPod.²¹ While individually, participants may have been motivated by personal gain, simply

19/ For more on how-to documents see Chapter 5: Telling Stories.

20/ <http://www.openobject.org/isop/> accessed 18 February 2011.

21/ The practice of cannibalising one object in order to repair another is well established within the automobile industry, both commercially in the form of wreckers yards and on an individual basis where farmers and auto-enthusiasts may own multiple versions of the same vehicle in various states of disrepair.

by submitting their iPod for repair they were aiding in the general repair process. iPods submitted for repair became a temporary, shared resource that dramatically extended iSOP's capabilities.

For 16 people iSOP was of significant benefit, as their iPods were returned to them in working order. However, with iPod sales in excess of 250 million units, 16 people does not seem that many. It is important to recall here the DIY ethos that emerged in the 1960s, where DIY was regarded as a way to enact change within one's own life through direct action. In this light, it is not the 16 participants who are significant, but rather the encouragement and assistance iSOP offered to people attempting their own repairs. Here, the iSOP website was particularly important, functioning as an archive for iPod repair procedures. The site has received approximately two thousand unique visitors a month and numerous comments from individuals who have used the information to facilitate their own repairs. One such individual, Gordon Watson, posted updates to the repair procedures, adapting the process to suit later model iPods.

6.13 Non-concurrent collaboration

The user-generated iPod repair guides used during the repair process often showed evidence of being developed and refined over an extended period of time. Individual accounts generally built on existing resources and extended this work in new directions. In Rosner and Bean's study of IKEA hacking, one participant labeled this form of communal development 'non-concurrent collaboration', noting that he was motivated to publish his own hacks 'because I love the idea of collaboration, even if it's not on the same project at the same time' (2009). Despite the individualistic nature of hacking, modding and DIY repair, participants share a strong sense of communal action. This form of collaboration does not rely on formal institutions or direct communication between participants; instead it is based in participants' willingness to speak about their experiences and their ability to do so.²² Non-concurrent collaboration often occurs through loose affiliations rather than more traditional long-term work relations. Yochai Benkler claims these loose affiliations form a more open, participatory environment, stating that, 'The very fluidity and low commitment required of any given cooperative relationship increases the range and

22/ This practice of freely sharing information has been termed 'free revealing' and is particularly widespread within user-generated content and open source communities (Von Hippel, 2005).

diversity of cooperative relations people can enter, and therefore of collaborative projects they can conceive of as open to them' (2006).

The Internet is particularly well suited to the development of non-concurrent collaboration, providing a space where communal dialogue may emerge independent of participant's geographic or temporal location.²³ In addition to this, the searchable nature of online content means that documents need not be published to a central repository in order to be discoverable. Search terms become the mechanism by which content is collected and collated, providing ad-hoc groupings of data from a diverse array of sources. The resulting collection of documents and web pages form a layered, multi-vocal space where individuals select their own paths through the text. By adding their voices to this space, practitioners consolidate the existing material and extend the discussion into new domains.

6.14 Shared space

While the Internet facilitates the creation of a heterogeneous discursive space, it is the genericness of the mass-produced object that gives this discussion a common ground. Often criticized for its homogenizing effect, the mass-produced object presents consumers with uniform material performance, similar user experiences, and often highly predictable modes of failure. This material uniformity allows for practices of use to be repeated by users regardless of their specific geographic location or circumstance and, consequently, a repair process that works for one user is likely also to work for others. Traditionally, consumer activity has been dispersed throughout society, existing as isolated, often private, engagements. However, as we have seen, the Internet's ability to bridge geographic and temporal locations has dramatically shifted this relationship: object use has become a public act.

When the mass-produced, widely distributed object becomes linked to diverse user accounts, a dramatic shift occurs in the nature of the object. Bruce Sterling has termed this new form of object-hood a 'spime'. According to Sterling, every spimed object generates a little puddle of experience that adds to our understanding of what the object is or could be. Sterling states:

'Since they are so well documented, every SPIME is a lab experiment of sorts. In older days, if an object was radically re-purposed by some

23/ Of course the Internet has its own spatial distribution that determines who can access and contribute to this discussion and who cannot. The uneven distribution of Internet access is commonly referred to as the 'digital divide', a division whose lines are drawn both globally, between the economically developed and developing countries, and locally, in terms of race, economic status, gender and geographic location (Norris, 2001).

24/ See the Electronic Frontier Foundation (EFF) an NGO that (amongst other things) documents, comments on, and challenges the validity of EU-LAs. http://ilt.eff.org/index.php/Contracts:_Click_Wrap_Licenses accessed 23 February 2011.

25/ See Lessig on user-generated Star Wars content (2007).

26/ See for example commentary around the Apple iPhone and the use of music as ringtones, <http://www.engadget.com/2007/09/07/know-your-rights-is-it-illegal-to-make-my-own-ringtones/> accessed 23 February 2011, and <http://www.roughlydrafted.com/2007/09/15/apples-itunes-ringtones-and-the-complex-world-of-copy-right-law/> accessed 23 February 2011.

27/ The term 'jailbroken' refers to an iPhone (or other technological device) that has had copy protection measures removed to allow the loading of unauthorised software and content. This estimate is based on Apple iPhone sales for 2007-2010 and a jailbreaking rate of 8.43% (Nelson, 2009).

28/ See, for example, EFF's successful appeal to the USA Copyright Office for an exemption in the DMCA to allow users to bypass manufacturers' protection mechanisms and enable handsets to execute unauthorised software applications (McCullagh, 2010).

eccentric, this data would be ignored or lost... A mass produced object can be compared to a grazing cow, while the same basic object when SPIMED becomes a scattered horde of ants. Each ant pursues a different trajectory and therefore covers a broader spectrum of technosocial possibilities' (2005, p. 49).

Within this highly networked environment, the 'puddles' of user generated data quickly become vast resources that threaten to overwhelm the manufacturer's documentation in both sheer volume and in the level of detail they present. The voices of users, hobbyists, critics, enthusiasts, hackers and modders all come together in a vast heterogeneous collection. Through this searchable, self-organizing and infinitely updatable discursive space, the consumer becomes the expert. Their collected knowledge says more about the object's use, its failings, its possibilities, its construction and operation than the manufacturer is ever willing or able to tell us. The depth of this knowledge destabilizes the manufacturer's position of authority and challenges the control mechanisms used to structure the space of consumption. Taking each control mechanism in turn it is possible to observe the following effects:

- Representations of use: Where manufacturers give us generic, idealized representations of use, consumers are concerned with the nitty-gritty, the nuanced and varied experience of real-world operation. These tales are not only far more relevant to us as potential consumers, they are also infinitely more interesting.
- Contractual control: While the contractual relationship established through warranties and EULAs continues to structure object use, consumers are deciding en masse that what they gain from breaking these agreements is far greater than what they give up. With copious amounts of user information documenting every aspect of the object, voiding a product's warranty is no longer a terrifying prospect. In addition to this, the EULAs that no one reads are being read. A few interested, determined and knowledgeable people – consumers that also happen to be lawyers and activists – are challenging the validity of these licenses,²⁴ publicly criticizing their restrictive nature,²⁵ and patiently explaining the intricacies of their Machiavellian designs and disempowering effects.²⁶
- Restricted product ecology: While manufacturers build temples to their brands – Apple stores and Sony centres – the customers

queuing outside these buildings become their most attentive and demanding audience. These consumers want the objects they love to be the best they possibly can be, and if manufacturers refuse to listen then they will take matters into their own hands. Unhappy with Apple's limited ecology, an estimated six million users have 'jailbroken' their iPhones.²⁷

- State regulation: While manufacturers have been highly successful in lobbying state regulatory bodies, community voices are growing in strength. The Free Software Foundation (FSF), Electronic Frontier Foundation (EFF), Creative Commons movement and many other NGOs are making themselves heard and affecting policy decisions.²⁸
- Control through design: As manufacturers lock down and seal up their technology, hackers and modders take up the challenge and find ways around the restricted environment. When the Apple iPod docking connector proved difficult for hobbyists to get hold of, members of the iPodLinux forum initiated a 'group buy', purchasing a large batch of these connectors and on-selling them to the modding community.²⁹
- Control of information: Deprived of detailed product information, customers will make their own. They will ask and answer not only the frequently asked questions, but also the infrequent, the obscure, and the outright strange and stupid questions.³⁰ They will track down every technical detail, every chip, every material, every manufacturing technique, every supplier, every workplace – right down to the level of a single screw and a single worker.³¹

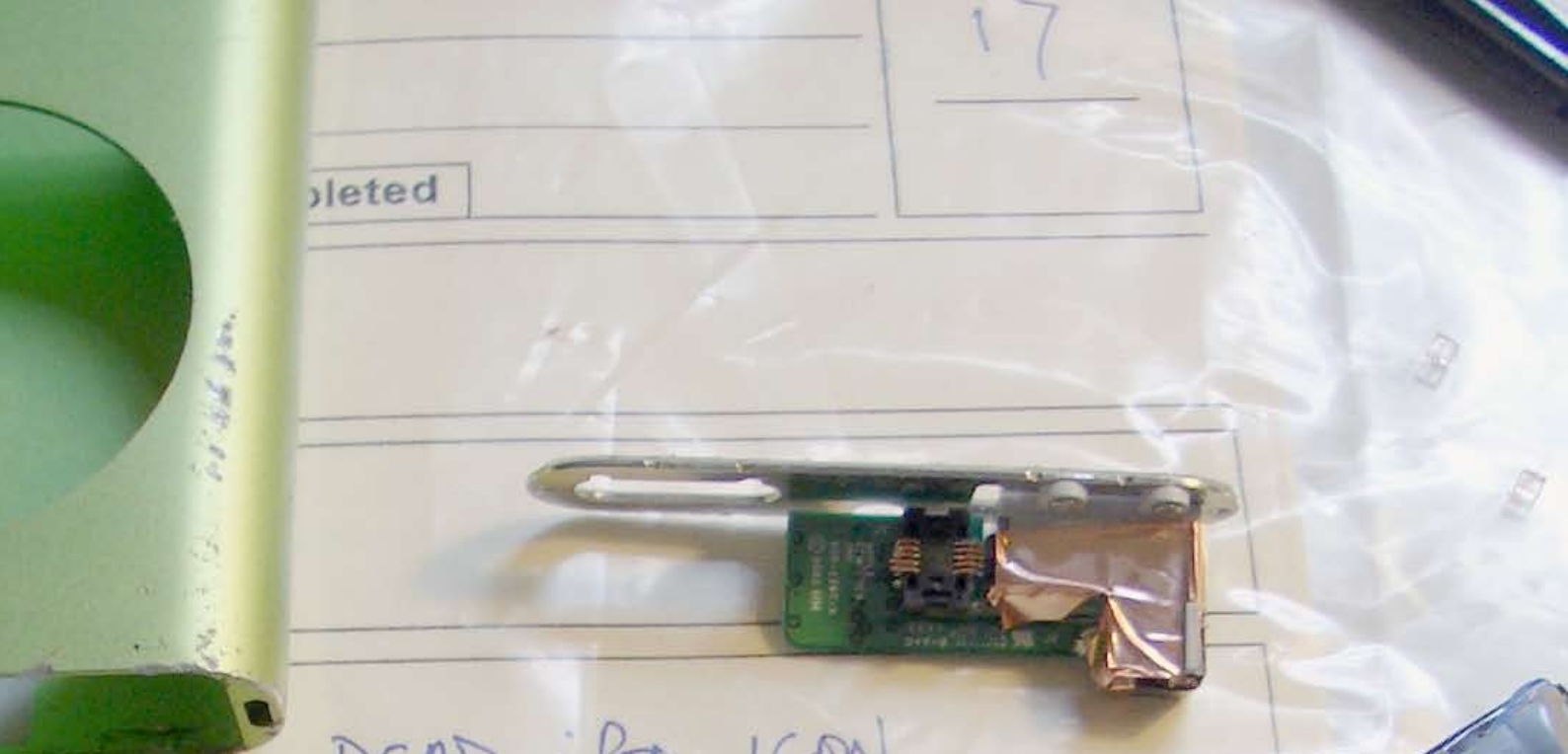
6.15 Conclusion

While interpretative flexibility is present in all objects, it is the consumers' ability to speak publicly about the objects they consume that challenges manufacturers' prescribed modes of consumption. As online consumer accounts continue to accumulate, the heterogeneity of object use will become increasingly apparent. It is arguable that consumer activity has never been so visible or interconnected; the public nature of this discursive space positions the object as a meeting place, a shared, negotiated space that enables individual and communal meaning structures to be formed. The more access and control the consumer has over this space, the greater their ability to construct meaningful relations within practices of consumption.

29/ See Chlazza's account of the group buy in his iPod Ultradock project, <http://www.chlazza.net/ultradock.html> accessed 27 February 2011.

30/ See for example the YouTube channel *Is it a good idea to microwave this?*, <http://www.youtube.com/show/isitagoodideatomicrowavethis?s=7> accessed 24 February 2011.

31/ Sterling claims that within 30 years all significant objects in our lives will be subject to this level of scrutiny (2005). We are not there yet, however consider the following: third-party parts supplier ifixit take apart the Apple iPhone 4 on the day of its release and provide detailed documentation of the disassembly process and components, <http://www.ifixit.com/Teardown/iPhone-4-Teardown/3130/1> accessed 24 February 2011; Apple changes the screws it's using on the iPhone 4 and gets wide coverage in online forums and hobbyist news sites, <http://www.tomshardware.com/news/ifixit-phillips-pentalobe-pentalobular-screw,12038.html> accessed 24 February 2011; in August 2008 an iPhone user in Britain found pictures of an assembly line worker on a newly purchased iPhone 3G. These pictures were posted to the online MacRumors forum, sparking a global effort to find the identity of the worker. The story was later picked up by numerous mainstream media sites (Hutcheon, 2008).



pleted

17

OFF, DEAD iPod icon.

ram (iSOP) and in con

g the



7. Conclusion

7.1 Overview

This research has found the mass-produced object to be a site of diverse activity. Far from being a fixed unchanging thing, the object emerges as a complex set of relations where object identity is formed and re-formed through repeated encounters. Within this shifting environment consumers actively engage the objects of mass-production and remake them to match their own needs and desires. Practices of object modification forge new paths and transform the discursive space of the object. These practices present a highly interconnected domain where individuals are eager to speak about what they do and actively form connections to parallel activities. The communities that emerge from such connections are often highly self-reflexive and place great importance on sharing, feedback, openness, and friendship.

While the consumer modification of objects is common within contemporary society, these divergent acts of use do not go unchallenged. As individuals engage the objects of mass-production they are confronted by forces that seek to structure the object's use in line with abstract economic models. The ability of producers to define the space of the object as their own means that consumers never take full possession of the objects they consume. The producer's position of authority allows them to dictate the 'correct' use of the object, dividing the field of possible uses into authorized and unauthorized zones. Through the authoritative voice of the expert, 'correct' use is positioned as logi-

[Figure 7-1 - facing page]
iPod repair for the *iPod Social*
Outreach Program, Melbourne,
Australia.
Image is author's own.

cal and commonplace, causing the producers 'abstract model' of use to appear natural, as if it arises from a natural condition of the object rather than being imposed by external forces. Unauthorized use thus becomes a deviation from the natural order of things, a form of deviant behavior framed as a fall away from logic and common sense. The consumer, operating within a territory controlled by others, is forced to adopt a tactical response, manipulating and circumventing control mechanisms, as they attempt to turn the situation to their own advantage. While their possible actions are given by the landscape in which they find themselves, they do not obey the rules of this place. Instead, they traverse the space creating a second order, or disorder, overlaid on the dominant logic.

Through this research I hope to have shown the transformative potential that practices of object modification offer. While these practices are often discussed in terms of functional or economic value, my experiences in the field present an alternate story. Rather than being orientated toward productive outcomes, practices of object modification privilege processes of exploration for their own sake. The transformative potential that these practices offer is both material and social, abstracting the given environment to create new relationships between thoughts and things.

7.2 Revolution

While practices of object modification are not new, recent developments in networked communications and media production have dramatically altered the conditions of their performance. The Internet has enabled practitioners to reach a broad audience and connect to a distributed network of like-minded people, collapsing traditional geographic and socioeconomic boundaries. This shift in the nature of consumer production has challenged established producer-consumer relations and led to claims of social revolution (Bruns, 2007; Leadbeater & Miller, 2004; Von Hippel, 2005). While acknowledging the revolutionary potential of these acts, the research finds that the distinction between production and consumption remains prevalent within contemporary society. Although various acts of consumer production have become virtually indistinguishable from forms of wage-based labour, this does not amount to a collapse of the producer-consumer

dynamic. When consumer practices are reduced to a reflection of capital processes, when they are taken as a mirror of professional practice (Leadbeater & Miller, 2004) or regarded as a research and development department driven by an equation of function and need (Von Hippel, 2005), important qualities of these practices are lost. These methods of framing, that conflate work and leisure, make work the defining form, the structure by which production is ultimately tested and judged. Such an approach does not give adequate account of productive acts that take place outside the capitalist economy. We must remember that commercial production is but a subset of human production and should not be used as the blueprint by which all productive acts are judged.

Contrary to much of the rhetoric surrounding emergent consumer production, distinctions between producers and consumers, as given through relations of power and modalities of action, continue to define the space of consumption. The emancipatory technology that has given visibility to divergent consumer practices has also allowed these practices to be targeted, manipulated, and captured by commercial interests. If the consumer is to be productive and *make this production known*, then their actions are generally subject to commercial control. It is worth noting that while farmers in the early 20th C. were free to tinker with the automobile, the owners of the Aibo robotic dog did not have the same rights.

7.3 Freedom

Despite complex control mechanisms, the research finds that practices of consumer production have consistently challenged commercial institutions. From the 1960s onwards acts of consumer production were seen as a means for activating social change, where practitioners enacted change in their own lives through direct action. Central to this approach is a belief that information should be free and open to everyone, an attitude that is visible within the Whole Earth Catalogue (Brand, 1968), Jencks' 'resource-full computer' (1972), punk and post-punk zine production (Triggs, 2006) and hacker attitudes from MIT in the 1960s to the open source software developers of today (Levy, 1984). While this belief in freedom of information has become an inherited ideology within practices of hacking, modding and DIY,

it is also reenforced through continual conflict within the consumer environment. As consumers are confronted with commercial control mechanisms that seek to restrict information they develop tactics that overcome these control mechanisms and re-assert their claim for free and open access.

This struggle within consumer society is essentially one of property rights, however consumers are not simply exerting a claim of ownership. The call for free and open access to information presents a fundamental challenge to established notions of intellectual property. By refusing to treat information as property, by giving it away or by rendering it a communal resource (as achieved through FOSS copyright license agreements), practices of consumer production rewrite the nature of intellectual property and undermine the privatising force of capitalism. In *A Hacker Manifesto* McKenzie Wark claims this challenge to intellectual property rights signals a revolution within contemporary society. While intrinsically linked to the revolutionary forces cited by Leadbeater and Miller (2004) and Von Hippel (2005), the threat here is more fundamental than a simple mirroring of professional practice. Acts of consumer production disrupt professional practice through a general disregard for the logic by which it operates; practices of hacking, modding and DIY are irreducible to economic, functional or professional concerns.

While consumer production may be captured by economic structures and positioned as a form of productive labour, there remains something excessive, illogical or deliberately disruptive in these divergent acts. This excess emerges in the non-utilitarian, the comic, and the fictive aspects of object modification and may be likened to Bill Brown's account of thingness as that which exceeds an object's materialization or utilization (2001). Hacking, modding and DIY practices are often proudly non-professional, non-commercial and anti-institutional.

These productive acts do not supplant one form of logic with another; rather they run amuck with the established order, challenging normalized relations and turning logical procedures on their head. Consumer production can best be understood as a form of creative play that seeks to explore the limits of the system in which it operates; as such, it is endlessly adaptive and responsive to circumstance. Introducing barriers in an attempt to limit divergent consumer behavior is equivalent to

building walls to prevent climbing – barriers simply become additional structures to be explored and known.

7.4 Do iPod owners really need social welfare?

To claim that a revolution will spring from a custom painted computer case seems a little ludicrous, and indeed there is a tongue-in-cheek element to many of the projects undertaken during this research. The *iPod Social Outreach Program*, for instance, raises the question: Do iPod owners really need a social welfare program? It's not a question that has an easy answer.

The consumer practices examined in this research are not driven by material or economic need; participants generally possess greater freedoms, material resources and personal agency than the majority of the people in the world. Given this, it would be easy to dismiss such practices as the leisure pursuits of a privileged few – as indeed they are. However, consumer culture has arguably become the dominant form of existence for a large section of society and the practices examined here appear to play an increasingly important role in shaping this environment. Coupled with this, we have seen that the excesses of consumer society, 'the showy products through which a productivist economy articulates itself' (Certeau, 1984, p. xvii), bring their own form of impoverishment and lack. With increasing precision consumers are positioned as renters, trespassers, even criminals, within their own material culture.

In *Thing Theory* Brown asks: 'If society seems to impose itself on the "corporeal imagination," when and how does that imagination struggle against the imposition, and what role do things, physically or conceptually, play in the struggle? How does the effort to rethink things become an effort to reinstitute society?' (2001, p. 10). Through dismantling, repairing, and reconfiguring the products of mass-production, consumers rethink their relation to the world and in doing so they claim ownership and agency within an alienating environment. Practices of consumer production establish a degree of plurality and creativity within consumer culture. As consumers figure the world in new and alternate ways, they make evident the constructed nature of normative practices of use. Qualities that were positioned as natural conditions of the object are revealed as commercial strategies manifest

in material and social form. In producing parallel narratives of use consumers open the discursive space of the object to a multiplicity of voices and a diverse array of social meanings.

7.5 Rethinking the object as public space

Where the commercial economy has traditionally isolated the individual within private acts of consumption, newly emergent networked practices remake acts of consumption as a communal endeavor. As John Seely Brown states: ‘Tinkering is no longer an isolated activity you do in your garage. You’re tinkering with a community platform, you’re tinkering with other people’s stuff’ (quoted in Lessig, 2004, p. 46). In contemporary society, the privately consumed mass-produced object becomes a distributed common ground, a sphere of action where people gather to discuss matters of collective concern. This site is provisional, in that it is given through the meeting of individuals and the discursive field that arises from this meeting. What is important here are not the material outcomes of the discussion but the process of engagement – the ability for individuals to join in conversation and exercise their powers of agency. If we were to conceive of the mass-produced object as a distributed public realm, a polis or form of public space, then we may ask: What limits should be placed on this space, who should be allowed to determine the conversations that take place here, and what freedoms are we willing to give up for the sake of economic returns?

The public is only beginning to understand how much has been lost to the increased privatization of the consumer environment. Laws such as the Digital Millennium Copyright Act, and the anti-circumvention measures given within this act, bring an unprecedented level of control to consumer society. If we wish to retain relevance and participation in public discourse then we need to ensure public spaces, wherever they may arise, do not disappear into private ownership.

7.6 Gaps in the research and future directions

In adopting a participatory approach to this research I was able to conduct a highly detailed study of the field of object modification. My pre-existing knowledge of practices of hacking and modding, including a familiarity with computers and electronics, helped to reduce the barriers to my participation and allowed for a deep understanding of

the practice to be developed. As I hope is reflected in my accounts of this practice, the participatory approach brought an intimacy to the research that could only be achieved through direct engagement.

However, it should be acknowledged that my account of this practice is partial, shaped by my own personal interests, abilities and social position. The study therefore provides a white, middle class, educated, male perspective and in this respect it may be regarded as a highly normative and privileged account. The fact that my participation in these practices was a transformative and liberating experience cannot be isolated from this privileged position; it is debatable whether these practices would be equally liberating for all participants. In order to address this bias within the research, further accounts that give reference to a broad array of experiences, particularly in relation to gender, ethnicity and varying levels of education are needed.

Further to this, a greater understanding of the communities that form through practices of object modification is required. Specifically, we need to ask what kinds of communities are created and what types of relations are produced? All too often the emergence of community is taken as a sign of democracy, however, while practices of object modification privilege free and open participation, it does not necessarily follow that these practices are intrinsically democratic. As Ned Rossiter states, newly emergent networks are based in 'relational processes, not representational procedures' (2006, p. 13). Within the field of object modification, communities are formed, not through democratic representation, but through active participation; participants that are the most active generally have the greatest degree of influence within the community. The openness of these communities, the nature of their organisational structure, and their vulnerability to commercial influence are all paths that require further investigation.

Finally, greater research is needed into the revolutionary potential of these acts. Do practices of object modification truly have the capacity to shift the nature of consumption or will these acts be subsumed into the commercial economy as new forms of productive labor? Here, the work of Ned Rossiter may be particularly useful in establishing how self-organizing networks, such as those centered around consumer production, may gain political agency and resist commercial domina-

tion. In addition, effective modes of resistance may be found within the practice itself. Documents such as the ‘Makers Bill of Rights’ (Jalopy, 2005) and the ‘Repair Manifesto’ (Platform21, 2009), while having little commercial influence, indicate a high level of political awareness within the practice and suggest a degree of organized resistance. Whether practices of object modification are effective in escaping commercial control may however lie in the disorganized resistance they offer. If commercial institutions fail to capture these practices as productive labor this will probably be due to the practices irreducibility to institutionalized logic and its endlessly adaptive, ad-hoc approach to its environment.

7.7 Active engagement

My participation in the field of object modification has highlighted the process-driven nature of these activities. The overwhelming experience has been one of perpetual engagement where actions remain open and responsive to the conditions of their environment. The modified object, far from being the sum of the practice, becomes a conduit through which the practice takes place (Warde, 2005, p. 138). While stories from the field, such as those presented in chapter five, begin to give insight into this experience, there remains aspects of the practice that cannot be captured or represented. These stories do not simply describe the practice, they enact it. As de Certeau states, ‘The story does not express a practice ... it makes it. One understands it, then, if one enters into this movement oneself’ (1984, p. 81).

In order to gain a deep understanding of these practices the individual must actively engage these stories. For me, this engagement has been a rewarding experience that has permanently changed my relationship to the objects in my life. Through publicly documenting this experience via the research blog I hope my activities provide encouragement to others – as I, in turn, have been encouraged by others. I encourage you to take up a role of object modifier and actively engage your material environment. From the evidence given in this research, there is a very good chance that this is something you already do.

Table of Images

| | |
|-------------|---|
| Figure 1-1 | Cantenna wireless antenna, constructed from a Golden Circle fruit juice tin, 2004. Image is author's own. |
| Figure 2-1 | Kitchen cupboard handle attached to the boot of a Ford Falcon sedan, Melbourne, Australia, 2004. Image is author's own. |
| Figure 3-1 | Planet Lamp parabolic microphone, 2005. Image is author's own. |
| Figure 3-2 | <i>FIX</i> counter, 2004. Image is author's own. |
| Figure 3-3 | <i>FIX</i> submission form, 2004. Image is author's own. |
| Figure 3-4 | Matchbox car before remaking, 2004. Image is author's own. |
| Figure 3-5 | Matchbox car after remaking, 2004. Image is author's own. |
| Figure 3-6 | IKEA footstool before remaking, 2004. Image is author's own. |
| Figure 3-7 | IKEA footstool after remaking, 2004. Image is author's own. |
| Figure 3-8 | Planet Lamp before remaking, 2004. Image is author's own. |
| Figure 3-9 | Fitting electronics to Planet Lamp, 2005. Image is author's own. |
| Figure 3-10 | Planet Lamp after remaking, 2005. Image is author's own. |
| Figure 3-11 | Amplifier circuit installed in Planet Lamp, 2005. Image is author's own. |
| Figure 3-12 | Planet Lamp parabolic microphone volume control, 2005. Image is author's own. |
| Figure 3-13 | Planet Lamp parabolic microphone headphone jack, 2005. Image is author's own. |
| Figure 4-1 | Tim Hirzel's modified Silvia coffee machine, 2006. Photograph Hirzel. |
| Figure 4-2 | Tim Hirzel's Silvia coffee machine with Arduino controller, 2008. Photograph Hirzel. |
| Figure 4-3 | Pokia handset, 2005. Image is author's own. |
| Figure 4-4 | Samsung NC10 3G modem hack by João de Oliveira, 2009. Photograph Oliveira. |
| Figure 4-5 | GameBoy Drum Machine (solenoid) hack by Jowan Sebastian, 2008. Photograph Sebastian. http://8bitplateau.net , accessed 10 July, 2010. |
| Figure 4-6 | Circuit bending a 'Speak & Spell'. Photograph Pete Edwards. http://www.casperelectronics.com , accessed 10 July, 2010. |
| Figure 4-7 | iPod firmware (graphics) hack developed by IpodWizard, 2004. Photograph Phillip Torrone. |
| Figure 4-8 | Traffic sign hacked in Gainesville, Florida, U.S.A. Photograph Amelia Wilhelm. http://www.gainesville.com/article/20091222/ARTICLES/912221017?tc=ar , accessed 10 July, 2010. |
| Figure 4-9 | IKEA bag raincoat by <i>scasper</i> . Photograph Stephanie Casper. http://www.flickr.com/photos/37564385@N06/4331201008/ , accessed 10 July, 2010. |
| Figure 4-10 | LCD monitor and computer keyboard mod by Sean Slattery (aka Jake von Slatt), 2007-2009. Photograph Slattery. http://steampunkworkshop.com/lcd.shtml , accessed 10 July, 2010. |
| Figure 4-11 | 'Steampunk Laptop' computer case mod by Richard Nagy (aka Datamancer), 2007. Photograph Nagy. http://www.datamancer.net/steampunklaptop/steampunklaptop.htm , accessed 10 July, 2010. |

- Figure 4-12 'Communicator PC' computer case mod by Cliff Wins (aka Maduncle), 2008-2009. Photograph Wins. <http://austepunk.blogspot.com/2008/09/days-away-from-first-power-up.html>, accessed 11 July, 2010.
- Figure 4-13 'Steampunk Frankenstein' computer case mod by Dana Mattock, 2006. Photograph Mattock. <http://www.flickr.com/photos/steampunkfrankenstein/sets/72157615106608643/with/3339974889/>, accessed 10 July, 2010.
- Figure 4-14 Mac Mini computer case mod by Dave Veloz, 2008. Photograph Veloz. <http://steampunkworkshop.com/daveveloz.shtml>, accessed 10 July, 2010.
- Figure 4-15 LEGO hard drive case by Larry Page and Sergey Brin, 1996. This storage assembly, containing ten 4GB disk drives was used in the development of the Digital Library project, an early incarnation of Google. Photograph Gio Wiederhold. <http://infolab.stanford.edu/pub/voy/museum/pictures/display/0-4-Google.htm>, accessed 11 July, 2010.
- Figure 4-16 'Big Blue' computer case mod by seb928, 2009. Photograph seb928. <http://www.brickshelf.com/cgi-bin/gallery.cgi?f=174449>, accessed 11 July, 2010.
- Figure 4-17 LEGO computer case mod by Kevin and James Deutsch, 2003. Photograph Kevin Deutsch. <http://legocomputer.com/>, accessed 11 July, 2010.
- Figure 4-18 'Legobox' computer case mod by Todd Ripplinger, 2002. Photograph Ripplinger. <http://www.mini-itx.com/projects/legobox/>, accessed 11 July, 2010.
- Figure 4-19 'LEGO Mac' computer case mod by Daniele Procida, 2003. Photograph Procida. <http://www.apple-juice.co.uk/pages/the-lego-mac.php>, accessed 11 July, 2010.
- Figure 4-20 Toaster computer case mod by Adam Bertram, 2003. Photograph Procida. <http://www.toasterpc.com/>, accessed 11 July, 2010.
- Figure 4-21 Toaster computer case mod by Gordon L. Johnson, 2007. Photograph Johnson. http://www.leetupload.com/toaster_computer/, accessed 11 July, 2010.
- Figure 4-22 'ToAsTOR' computer case mod by Joe Klingler, 2002. Photograph Klingler. <http://www.mini-itx.com/projects/toasterpc/>, accessed 11 July, 2010.
- Figure 4-23 'Nintoaster II' Nintendo case mod by Richard DaLuz, 2009. Photograph DaLuz. <http://www.stupidfingers.com/projects/nintoaster2/>, accessed 11 July, 2010.
- Figure 4-24 'Super Nintoaster' Super Nintendo case mod by Richard DaLuz, 2009. Photograph DaLuz. <http://www.stupidfingers.com/projects/snt/>, accessed 11 July, 2010.
- Figure 4-25 'MacQuarium' Apple Mac 128K computer case mod by Aleks Oniszcak, 2003. Photograph Oniszcak. <http://vividpicture.com/aleks/macquarium/>, accessed 11 July, 2010.
- Figure 4-26 'Two-Page MacQuarium' Apple 21" monochrome monitor case mod by Greg T. Anderson, 1998. Photograph Anderson. <http://homepage.mac.com/torgo/MacQuarium/Pages/Two-Page%20MacQuarium.html>, accessed 11 July, 2010.
- Figure 4-27 'MacQuarium' Apple 20" Studio Display case mod by Eric Chan, 2007. Photograph Chan. <http://picasaweb.google.com/erichan731/MacAquarium#>, accessed 11 July, 2010.
- Figure 4-28 'Monster iMacQuarium' Apple iMac computer case mod by Andrew Moses, 2005. Photograph Moses. <http://imacquarium.cool-mac.com/index.html>, accessed 11 July, 2010.
- Figure 4-29 'G4 CubeQuarium' Apple G4 Cube computer case mod by Joe and Carrie Ann, 2003. Photograph Joe. <http://home.comcast.net/~jleblanc77/cube/>, accessed 11 July, 2010.
- Figure 4-30 Title screen from *Castle Wolfenstein*, 1981. Image The first 'Official' Castle Smurfenstein Home Page, <http://www.evl.uic.edu/aej/smurf.html>, accessed 8 July 2010.
- Figure 4-31 Title screen from 'Castle Smurfenstein', 1983. Image The first 'Official' Castle Smurfenstein Home Page, <http://www.evl.uic.edu/aej/smurf.html>, accessed 8 July 2010.
- Figure 5-1 Searching for bats with the Cylindric Ultrasonic Bat Detector, Melbourne, Australia, 2004. Image is author's own.

| | |
|-------------|--|
| Figure 5-2 | Cylindric Ultrasonic Bat Detector, Finished bat detector, 2005. Image is author's own. |
| Figure 5-3 | Cylindric Ultrasonic Bat Detector, Original Braun lighter (1968), 2005. Image is author's own. |
| Figure 5-4 | Cylindric Ultrasonic Bat Detector, Ultrasonic detector circuit diagram based on Tony Messina's design, 2005. Image is author's own. |
| Figure 5-5 | Cylindric Ultrasonic Bat Detector, Ultrasonic transducer, 2005. Image is author's own. |
| Figure 5-6 | Cylindric Ultrasonic Bat Detector, Original Braun lighter – disassembled, 2005. Image is author's own. |
| Figure 5-7 | Cylindric Ultrasonic Bat Detector, Discarded ink cartridge, 2005. Image is author's own. |
| Figure 5-8 | Cylindric Ultrasonic Bat Detector, Fitting the ink cartridge, 2005. Image is author's own. |
| Figure 5-9 | Cylindric Ultrasonic Bat Detector, Assembling the components, 2005. Image is author's own. |
| Figure 5-10 | Cylindric Ultrasonic Bat Detector, Fitting the ultrasonic transducer, 2005. Image is author's own. |
| Figure 5-11 | Cylindric Ultrasonic Bat Detector, Original Braun lighter – base, 2005. Image is author's own. |
| Figure 5-12 | Cylindric Ultrasonic Bat Detector, 2.5mm mono audio plug, 2005. Image is author's own. |
| Figure 5-13 | Cylindric Ultrasonic Bat Detector, Modified 2.5mm mono audio plug, 2005. Image is author's own. |
| Figure 5-14 | Cylindric Ultrasonic Bat Detector, Modifying the switch, 2005. Image is author's own. |
| Figure 5-15 | Cylindric Ultrasonic Bat Detector, Constructing the volume knob, 2005. Image is author's own. |
| Figure 5-16 | Cylindric Ultrasonic Bat Detector, Installing the volume knob, 2005. Image is author's own. |
| Figure 5-17 | Cylindric Ultrasonic Bat Detector, Fitting the components, 2005. Image is author's own. |
| Figure 5-18 | Cylindric Ultrasonic Bat Detector, Final installation, 2005. Image is author's own. |
| Figure 5-19 | Cylindric Ultrasonic Bat Detector, Finished bat detector, 2005. Image is author's own. |
| Figure 5-20 | Cylindric Ultrasonic Bat Detector, Bat detector active, 2005. Image is author's own. |
| Figure 5-21 | Cylindric Ultrasonic Bat Detector, Bat detector at VCA gallery, 2005. Image is author's own. |
| Figure 5-22 | Bat detector by Steven, 2009. Photograph Steven. |
| Figure 5-23 | B&O MP3 Mod, Macintosh ADB mouse – internal workings, 2006. Image is author's own. |
| Figure 5-24 | B&O MP3 Mod, PowerBook G3 – internal workings, 2006. Image is author's own. |
| Figure 5-25 | B&O MP3 Mod, PowerBook G3 – internal ADB connector, 2006. Image is author's own. |
| Figure 5-26 | B&O MP3 Mod, PowerBook G3 – internal ADB diagram, 2006. Image is author's own. |
| Figure 5-27 | B&O MP3 Mod, PowerBook G3 – testing the internal ADB connector, 2006. Image is author's own. |
| Figure 5-28 | B&O MP3 Mod, Linear encoder, 2006. Image is author's own. |
| Figure 5-29 | B&O MP3 Mod, Linear encoder – detail, 2006. Image is author's own. |
| Figure 5-30 | B&O MP3 Mod, Testing the linear encoder, 2006. Image is author's own. |
| Figure 5-31 | B&O MP3 Mod, Bang and Olufson slider, 2006. Image is author's own. |
| Figure 6-1 | RetroPod iPod case by John Young, 2004. Photograph Young. |
| Figure 6-2 | Ford Model-T automobile used to power a small saw mill. Photograph from the Collections of The Henry Ford. |
| Figure 6-3 | Circuit diagram attached to the rear of a 1980s JVC television, photo 2005. Image is author's own. |
| Figure 6-4 | RetroPod iPod case by John Young, 2004. Photograph Young. |
| Figure 6-5 | GI Joe computer model for game mod. Model and image by KMP, http://www.k-m-p.com/?p=64 accessed 3 March 2011. |

- Figure 6-6 Sony Aibo, 2008. Photograph Schockwellenreiter.
- Figure 6-7 Pentalobe screws on Apple iPhone casing, 2011. Image is author's own.
- Figure 6-8 Insulated recording studio (cardboard box) by Nils Schneider, 2004. Photograph Schneider.
- Figure 6-9 Apple iPod running iPodLinux, 2008. Image is author's own.
- Figure 6-10 Text from Make magazine t-shirt, 2010. Image Make Media.
- Figure 6-11 Street advertisement for iSOP, Melbourne, Australia, 2006. Image is author's own.
- Figure 6-12 iSOP repair desk, Uplands gallery, Melbourne, Australia, 2006. Image is author's own.
- Figure 6-13 Opening the iPod with a guitar pick, 2006. Image is author's own.
- Figure 6-14 Fixing an iPod suffle with coloured ribbon cable, 2006. Image is author's own.
- Figure 7-1 iPod repair for the *iPod Social Outreach Program*, Melbourne, Australia. Image is author's own.

Bibliography

- Andreou, H. (2007). Case modding.... Why? Retrieved 14 February 2010, 2010, from <http://88bytes.com/blog/?p=41>
- Angelo, Score, J., WhiteWalls Inc., & Temporary Services (Group of artists). (2003). *Prisoners' inventions*. Chicago, Ill.: WhiteWalls Inc.
- Apple Computer Inc. (2003). *PowerBook G3 Series, M4753*: Apple Computer Inc. Service Source.
- Arkhipov, V. (2006). *Home-made : contemporary Russian folk artifacts*. London: Fuel Publishing.
- Atkinson, P. (2006). Do It Yourself: Democracy and Design. *J Design Hist*, 19(1), 1-10.
- Au, W. J. (2002). Triumph of the mod. *Salon.com*, 4. Retrieved from <http://dir.salon.com/tech/feature/2002/04/16/modding/index.html>
- Bailey, A. (2007, 9 September 2007). Origins of the word "machinima". Retrieved 3 July 2010, 2010, from <http://anthonybailey.net/blog/2007/09/09/origins-of-the-word-machinima>
- Banks, J., & Humphreys, S. (2008). The Labour of User Co-Creators. *Convergence: The International Journal of Research into New Media Technologies*, 14(4), 401-418.
- Benjamin, A. (1993). Matter and Meaning: On Installations. *Art & design*, 8(33), 3.
- Benkler, Y. (2006). *The wealth of networks : how social production transforms markets and freedom*. New Haven [Conn.]: Yale University Press.
- Bennington, G. (1998). A companion to continental philosophy. In S. Critchley & W. R. Schroeder (Eds.), *Blackwell companions to philosophy* (pp. xv, 679 p.). Oxford, UK ; Malden, Mass.: Blackwell.
- Berger, P. L., & Luckmann, T. (1984). *The social construction of reality : a treatise in the sociology of knowledge*. London: Penguin.
- Bourdieu, P. (1986). The Forms of Capital. In J. G. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. pp. 241-258). New York: Greenwood Press.
- Brand, S. (1968a). The Whole Earth Catalog. Access to tools. (pp. v.). Menlo Park, Calif.,: Portola Institute.
- Brand, S. (Ed.). (1968b). *Whole Earth Catalog*. Menlo Park, Calif.,: Portola Institute.
- Brandes, U., Stich, S., & Wender, M. (2009). *Design by use : the everyday metamorphosis of things*. Basel ; Boston: Birkh–auser.
- Brown, B. (1998). How to do things with things (A toy story) (Material culture, semiotics, imagery). [Review]. *Critical Inquiry*, 24(4), 935-964.
- Brown, B. (1999). The Secret Life of Things (Virginia Woolf and the Matter of Modernism). *Modernism/Modernity*, 6(2), 28.
- Brown, B. (2001). Thing Theory. *Critical Inquiry*, 28(1), 1-22.
- Brown, B. (2004). *Things*. Chicago: University Of Chicago Press.
- Bruns, A. (2007). *Produsage*. Paper presented at the Proceedings of the 6th ACM SIGCHI conference on Creativity \& cognition.
- Bruns, A. (2008). *Blogs, Wikipedia, Second Life, and beyond : from production to produsage*. New York: Peter Lang.

- Buechley, L., Paulos, E., Rosner, D., & Williams, A. (2009). *DIY for CHI: Methods, Communities, and Values of Reuse and Customization*. Paper presented at the Workshop at ACM SIGCHI.
- Byrnes, J., & Voyles, K. (2009). Don't fear: Zombies are not near. *The Gainesville Sun*. Retrieved from <http://www.gainesville.com/apps/pbcs.dll/article?AID=/20091222/ARTICLES/912221017&tc=ar>
- Caporael, L. R. (1986). Anthropomorphism and mechanomorphism: Two faces of the human machine. [doi: DOI: 10.1016/0747-5632(86)90004-X]. *Computers in Human Behavior*, 2(3), 215-234.
- CBS News. (2002, 23 July 2002). Ottawa man convicted for selling PlayStation 'mod chips'. *CBS News*. Retrieved from http://www.cbc.ca/news/story/2002/07/23/mod_chip020723.html
- Certeau, M. d. (1984). *The practice of everyday life*. Berkeley: University of California Press.
- Chesbrough, H. W. (2006). *Open innovation : the new imperative for creating and profiting from technology*. Boston, Mass.: Harvard Business School Press.
- Clute, J., & Grant, J. (1997). *The encyclopedia of fantasy*. London: Orbit.
- Cockburn, C., & Ormrod, S. (1993). *Gender and technology in the making*. London ; Thousand Oaks, Calif.: Sage.
- Colebrook, C. (2001). Certeau and Foucault: Tactics and Strategic Essentialism. *South Atlantic Quarterly*, 100(2), 543-574.
- Corney, J., Torres-Sanchez, C., Jagadeesan, A. P., & Regli, W. (2010). Outsourcing labour to the cloud. *International Journal of Innovation and Sustainable Development*, 4(4), 20.
- Cowan, R. S. (1983). *More work for mother : the ironies of household technology from the open hearth to the microwave*. New York: Basic Books.
- Cummings, N. (1993). *Reading things*. London: Chance Books.
- Curtis, B. (2004, 27 July 2004). Preparing for Doom 3. Retrieved 3 July 2010, 2010, from <http://www.sodabob.com/3DGames/Quake.asp?MenuID=7>
- Dalrymple, M., & Hillegrass, A. (2003). *Core Mac OSX and Unix Programming*: Big Nerd Ranch.
- Davidson, J. D., & Apple Computer Inc. (2002). *Learning Cocoa with Objective-C* (2nd ed.). Beijing ; Sebastopol, Calif.: O'Reilly.
- Dibel, J. (1990, July 24, 1990). Rebel Hackers: The Computer Kids who Phreak Out the Feds. *Village Voice*.
- Dixon, T. (2000). *Rethink*. London: Conran Octopus.
- Doom Wiki. (2005, 19 July 2008). Doom Editing Utilities. Retrieved 3 July 2010, 2010, from http://doom.wikia.com/index.php?title=Doom_Editing_Uilities&action=history
- Droit, R.-P. (2005). *How are things? : a philosophical experiment*. London: Faber.
- Duncombe, S. (1997). *Notes from underground : zines and the politics of alternative culture*. London ; New York: Verso.
- Gilham v R [2009] EWCA Crim 2293 (2009).
- Eriksen, T. H., & Nielsen, F. S. (2001). *A history of anthropology*. London: Pluto Press.
- Farivar, C. (2002, July 18 2002). Case studies. *The Age*. Retrieved from <http://www.theage.com.au/articles/2002/07/18/1026802705403.html>
- Ferla, R. L. (2008, 8 May 2008). Steampunk Moves Between 2 Worlds. *The New York Times*. Retrieved from http://www.nytimes.com/2008/05/08/fashion/08PUNK.html/?_r=1
- Flowers, S. (2008). Harnessing the hackers: The emergence and exploitation of Outlaw Innovation. [doi: DOI: 10.1016/j.respol.2007.10.006]. *Research Policy*, 37(2), 177-193.
- Foresman, C. (2011). Apple "screwing" new iPhones out of simple DIY repair. *Ars Technica*. Retrieved from <http://arstechnica.com/apple/news/2011/01/apple-screwing-new-iphones-out-of-simple-diy-repair.ars>
- Forlizzi, J. (2007). *How robotic products become social products: an ethnographic study of cleaning in the home*. Paper presented at the Proceedings of the ACM/IEEE international conference on Human-robot interaction.

- Forlizzi, J. (2008). *The Product Ecology: Understanding Social Product Use and Supporting Design Culture*.
- Forlizzi, J., & Battarbee, K. (2004). *Understanding experience in interactive systems*. Paper presented at the Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques.
- Fox, B. (2002, 15 February 2002). Sony PlayStation ruling sets far-reaching precedent. *New Scientist*.
- Frankel, S. (2006). The source of all evil. Retrieved 3 July 2010, 2010, from <http://dustyfeet.com/evil/enemy.html>
- Gelber, S. M. (1997). Do-It-Yourself: Constructing, Repairing and Maintaining Domestic Masculinity. *American Quarterly*, 49(1), 66-112.
- Gelber, S. M. (1999). *Hobbies : leisure and the culture of work in America*. New York: Columbia University Press.
- Gibson, J. (2006, 19 October 2006). iPod wins Shonky gong. *The Sydney Morning Herald*. Retrieved from <http://www.smh.com.au/news/national/ipod-wins-shonky-award/2006/10/19/1160851044389.html>
- Gloor, P. A. (2006). *Swarm creativity : competitive advantage through collaborative innovation networks*. New York: Oxford University Press.
- Goldman, R., & Gabriel, R. P. (2005). *Innovation happens elsewhere : open source as business strategy*. Amsterdam, The Netherlands: Morgan Kaufmann.
- Gosling, T. (2004). "Not For Sale": The Underground Network of Anarcho-Punk. In R. A. Peterson & A. Bennett (Eds.), *Music scenes : local, translocal & virtual* (1st ed. ed., pp. xvi, 264). Nashville, Tenn.: Vanderbilt University Press.
- Green, E., Hebron, S., & Woodward, D. (1990). *Women's leisure, what leisure?* Basingstoke, Hamps.: Macmillan Education.
- Hackett, B., & Lutzenhiser, L. (1985). The Unity of Self and Object. *Western Folklore*, 44(4), 8.
- Hall, T. (2010, 18 February 2010). Nintendo wins lawsuit over R4 mod chip piracy. *itnews*.
- Haraway, D. J. (1991). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. In D. J. Haraway (Ed.), *Simians, cyborgs, and women : the reinvention of nature* (pp. x, 287 p., [212] p. of plates). London: Free Association.
- Stevens v Kabushiki Kaisha Sony Computer Entertainment (2005).
- Hirzel, T. (2004, November 2006). See Through Silvia. Retrieved 3 July 2010, 2010, from <http://www.growdown.com/espressomod/philosophy.php>
- Hirzel, T. (2006, 3 July 2010). Rancilio Silvia "PID PIC NES" mod. <http://growdown.blogspot.com/2006/11/custom-silvia-pid-mod.html>
- Holtzman, B., Hughes, C., & Meter, K. V. (2007). Do It Yourself... and the Movement Beyond Capitalism. In S. Shukaitis, D. Graeber & E. Biddle (Eds.), *Constituent imagination : militant investigations//collective theorization* (pp. 336 p.). Oakland, CA: AK Press.
- Huhtamo, E. (1999). Game Patch - the Son of Scratch: Plug-ins and Patches as Hacker Art. *Switch*(12).
- Hunter, W. (1998-2000). The Dot Eaters - Player4 Stage1 - Classic Video Game History. Retrieved 3 April, 2010, from <http://www.emuunlim.com/doteaters/index.htm>
- Hutcheon, S. (2008). Net mob search for iPhone girl's identity. *The Sydney Morning Herald*. Retrieved from <http://www.smh.com.au/news/iphone-insider/human-flesh-search-engine-in-hot-pursuit/2008/08/28/1219516602946.html>
- Ihnatko, A. (1992). The Original Macquarium. Retrieved from <http://www.cs.tut.fi/~ace/macquarium.html>
- Jackson, A. (2006). Labour as Leisure--The Mirror Dinghy and DIY Sailors. *J Design Hist*, 19(1), 57-67.
- Jalopy, M. (2005). MAKER'S BILL OF RIGHTS. *Make: Magazine*.
- Jencks, C., & Silver, N. (1972). *Adhocism : the case for improvisation* ([1st ed.] ed.). New York: Doubleday.

- jmke. (2004). Back to the basics - modding that dull grey Box with a twist. Retrieved 3 July 2010, 2010, from <http://www.madshrimps.be/?action=getarticle&articID=206>
- Kaminski, M. (2004). *Games prisoners play : the tragicomic worlds of Polish prison*. Princeton, N.J. ; Oxford: Princeton University Press.
- Kearney, M. C. (1997). The Missing Links, Riot grrrl - feminism - lesbian culture. In S. Whiteley (Ed.), *Sexing the groove : popular music and gender* (pp. 207, 353 p.). London ; New York: Routledge.
- Kline, R., & Pinch, T. (1996). Users as Agents of Technological Change: The Social Construction of the Automobile in the Rural United States. *Technology and Culture*, 37(4), 763-795.
- Knight, W. (2005). iPod 'squeaks' betray software secrets. *NewScientist Tech*. Retrieved from <http://www.newscientist.com/article/dn7085>
- Kücklich, J. (2005). Precarious Playbour: Modders and the Digital Games Industry. *Fiberculture*, (5). Retrieved from <http://www.journal.fibreculture.org/issue5/kucklich.html>
- Kushner, D. (2002). The Mod Squad. *Popular Science*, 261.
- Kuznetsov, S., & Paulos, E. (2010). *Rise of the expert amateur: DIY projects, communities, and cultures*. Paper presented at the Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries.
- Law, J. (2000). On the Subject of the Object: Narrative, Technology, and Interpellation. *Configurations*, 8(1), 29.
- Leadbeater, C., & Miller, P. (2004). The Pro-Am Revolution: How Enthusiasts are Changing our Economy and Society: DEMOS.
- Lee, M. J. (2000). Introduction. In M. J. Lee (Ed.), *The consumer society reader* (pp. xxvi, 325 p.). Malden, Mass. ; Oxford: Blackwell.
- Lessig, L. (2004). *Free culture : how big media uses technology and the law to lock down culture and control creativity*. New York: Penguin Press.
- Lessig, L. (2007). Lucasfilm's Phantom Menace. *The Washington Post*. Retrieved from <http://www.washingtonpost.com/wp-dyn/content/article/2007/07/11/AR2007071101996.html?hpid=opinionsbox1>
- Levy, S. (1984). *Hackers : heroes of the computer revolution* (1st ed.). Garden City, N.Y.: Anchor Press/Doubleday.
- Levy, S. (2001). *Hackers : heroes of the computer revolution* ([Updated afterword] ed.). New York, N.Y.: Penguin Books.
- Lucsko, D. N. (1998). *Manufacturing Muscle: The Hot Rod Industry and the American Fascination with Speed, 1915-1984*. Massachusetts Institute of Technology, Massachusetts.
- Madison, M. J. (2005). Law as Design: Objects, Concepts and Digital Things. *University of Pittsburgh School of Law Working Paper Series*, (Working Paper 12). Retrieved from <http://law.bepress.com/pittlwps/papers/art12>
- Manjoo, F. (2001). Aibo Owners Biting Mad at Sony. *Wired*. Retrieved from <http://www.wired.com/techbiz/media/news/2001/11/48088>
- Marx, K., & Elster, J. (1986). *Karl Marx : a reader*. Cambridge: Cambridge University Press.
- McCullagh, D. (2004, 3 August 2004). Trade deal exports DMCA down under. *cnet*.
- McCullagh, D. (2010). Feds say mobile-phone jailbreaking is OK. *cnet News*. Retrieved from http://news.cnet.com/8301-13578_3-20011661-38.html
- McKay, G. (1998). *DiY culture : party & protest in Nineties Britain*. London ; New York: Verso.
- McNamara, T. (2005, 26 July 2005). The DOOM Effect: Looking back on the legacy that's finally going to the silver screen. *IGN*.
- Miller, D. (1998). *Material cultures : why some things matter*. Chicago: University of Chicago Press.
- Miller, J. R. (2009). Hackers Crack Into Texas Road Sign, Warn of Zombies Ahead. *Fox News .com*. Retrieved from <http://www.foxnews.com/story/0,2933,484326,00.html>

- Mitchell, W. J. T. (1998). Why Children Hate Dinosaurs. In W. J. T. Mitchell (Ed.), *The last dinosaur book : the life and times of a cultural icon* (pp. 321 p.). Chicago: University of Chicago Press.
- Moorhouse, H. F. (1991). *Driving ambitions : an analysis of the American hot rod enthusiasm*. Manchester ; New York: Manchester University Press : Distributed exclusively in the USA and Canada by St. Martin's Press.
- Nelson, R. (2009). Jailbroken stats: Recent survey suggests 8.43% of iPhone users jailbreak. *iPhoneFreak*. Retrieved from <http://www.iphonefreak.com/2009/08/jailbroken-stats-recent-survey-suggests-843-of-iphone-users-jailbreak.html>
- Nieborg, D. B. (2005). *Am I Mod or Not? - An analysis of First Person Shooter modification culture*. Paper presented at the Creative Gamers Seminar - Exploring Participatory Culture in Gaming. Retrieved from http://www.gamespace.nl/content/DBNieborg2005_CreativeGamers.pdf
- Nietzsche, F. W. (1954). On Truth and Lie in an Extra-Moral Sense (W. Kaufmann, Trans.) *The portable Nietzsche* (pp. 687 p.). New York,: Viking Press.
- Ninan, A., Oakley, K., & Hearn, G. N. (2004). Queensland Music Industry Trends: Independence Day? : CIRAC, Creative Industries Faculty, QUT.
- Norris, P. (2001). *Digital divide : civic engagement, information poverty, and the Internet*. Cambridge ; New York: Cambridge University Press.
- Oakley, A. (1975). *The sociology of housework* (1st American ed.). New York: Pantheon Books.
- Piano, D. (2003). Resisting Subjects: DIY Feminism and the Politics of Style in Subcultural Production. In D. Muggleton & R. Weinzierl (Eds.), *The post-subcultures reader* (1st ed., pp. xii, 324 p.). Oxford ; New York: Berg.
- Pinch, T. (1996). The Social Construction of Technology: A Review. In R. Fox (Ed.), *Technological change : methods and themes in the history of technology* (pp. vii, 271 p.). Australia ; United States: Harwood Academic.
- Pinch, T. J., & Bijker, W. E. (1984). The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other. *Social Studies of Science*, 14(3), 399-441.
- Platform21. (2009). Repair Manifesto. 1. Retrieved from <http://www.platform21.nl/download/4453>
- Pollak, M. (2000). SCREEN GRAB; A Sport for Purists: Belt-Sander Races. *The New York Times*. Retrieved from <http://query.nytimes.com/gst/fullpage.html?res=9D0DE0D7153FF930A35751C0A9669C8B63>
- Pope, G. T. (1992, June 1992). America's Last – and best – Shuttle. *Popular Mechanics*.
- Postigo, H. (2003). From Pong to Planet Quake: Post-Industrial Transitions from Leisure to Work. *Information, Communication & Society*, 6(4), 593 - 607.
- Postigo, H. (2008). Video Game Appropriation through Modifications. *Convergence: The International Journal of Research into New Media Technologies*, 14(1), 59-74.
- QuickJump. (2007, 22 June 2007). ELSPA's successful piracy raid in England. Retrieved 3 July 2010, 2010, from <http://www.qj.net/psp/news/elspas-successful-piracy-raid-in-england.html>
- racketboy. (2006, 22 June 2006). Retro Gaming Dream Machines. Retrieved 3 July 2010, 2010, from <http://www.racketboy.com/retro/2006/06/retro-gaming-dream-machines.html>
- Raymond, E. S. (1996). *The new hacker's dictionary* (3rd ed.). Cambridge, Mass.: MIT Press.
- Raymond, E. S. (2001, 3 November 2008). How To Become A Hacker. Retrieved 11 February 2010, 2010, from <http://www.catb.org/~esr/faqs/hacker-howto.html>
- Raymond, E. S. (2004). The Jargon File, version 4.4.8. Retrieved from <http://www.catb.org/jargon/>
- Reckwitz, A. (2002). The Status of the "Material" in Theories of Culture: From "Social Structure" to "Artefacts". *Journal for the Theory of Social Behaviour*, 32(2), 195-217.
- Reynolds, R. (2008). *On Guerrilla Gardening: A Handbook For Gardening Without Boundaries*. London: Bloomsbury.

- Rimmer, M. (2006). Robbery Under Arms: Copyright Law and the Australia-United States Free Trade Agreement. *First Monday*, Vol. 11, No. 3, 2006.
- Robischon, N. (2007). Mod-Friendlt 5th Gen iRobot Roomba - First Vacuum. *Gizmodo*. Retrieved from <http://gizmodo.com/#!291906/modfriendly-5th-gen-irobot-roomba-first-vacuum>
- Rosner, D., & Bean, J. (2009). *Learning from IKEA hacking: i'm not one to decoupage a tabletop and call it a day*. Paper presented at the Proceedings of the 27th international conference on Human factors in computing systems.
- Ross, A. (2000). Hacking away at the counter-culture. In D. Bell & B. M. Kennedy (Eds.), *The cybercultures reader* (pp. 254, 267 p.). London ; New York: Routledge.
- Saussure, F. d., Bally, C., Sechehay, A., Riedlinger, A., & Harris, R. (1983). *Course in general linguistics*. London: Duckworth.
- Schatzki, T. R. (1996). *Social practices : a Wittgensteinian approach to human activity and the social*. New York: Cambridge University Press.
- Schutz, A., & Luckmann, T. (1974). *The structures of the life-world*. London: Heinemann.
- Sherwood, J. (2007). Court convicts 'million pound' modchip man. *The Register*.
- Shove, E., & Southerton, D. (2000). Defrosting the Freezer: From Novelty to Convenience: A Narrative of Normalization. *Journal of Material Culture*, 5(3), 301-319.
- Slater, D. (1997). *Consumer culture and modernity*. Oxford, UK: Cambridge, Mass.: Polity Press ; Blackwell Publishers.
- Smith, R., & Maughan, T. (1997). *Youth culture and the making of the post-Fordist economy: Dance music in contemporary Britain*. London: Royal Holloway Univ. of London (United Kingdom). Dept. of Social Policy and Social Science.
- Smith, T. (2008). UK appeal court dismisses mod chip conviction. *The Register*.
- Söderberg, J. (2008). *Hacking capitalism : the free and open source software movement*. New York: Routledge.
- Sotamaa, O. (2005). Creative User-Centered Design Practices: Lessons from Game Cultures. In L. Haddon (Ed.), *Everyday innovators researching the role of users in shaping ICT's* (pp. 13 p.). Dordrecht: Springer.
- St John Wilson, C. (1995). *The other tradition of modern architecture : the uncompleted project*. London: Academy Editions.
- Stallman, R. (2002). On Hacking. Retrieved 11 February 2010, 2010, from <http://www.stallman.org/articles/on-hacking.html>
- Sterling, B. (2005). *Shaping things*. Cambridge, Mass.: MIT Press.
- Thompson, H., & Whittington, N. (2009). *Remake it : home : the essential guide to resourceful living, with over 500 tricks, tips and inspirational designs*. London: Thames & Hudson.
- Thrift, N. (2006). Re-inventing invention: new tendencies in capitalist commodification. *Economy and Society*, 35(2), 27.
- Toffler, A. (1970). *Future Shock*. London: Bodley Head.
- Toffler, A. (1980). *The third wave* (1st ed. ed.). New York: Morrow.
- Torrey, C., McDonald, D., Schilit, B., & Bly, S. (2007). How-To pages: Informal systems of expertise sharing. In L. Bannon, I. Wagner, C. Gutwin, R. Harper & K. Schmidt (Eds.), *ECSCW 2007* (pp. 391-410): Springer London.
- Traweek, S. (1988). *Beamtimes and lifetimes : the world of high energy physicists*. Cambridge, Mass.: Harvard University Press.
- Triggs, T. (2006). Scissors and Glue:: Punk Fanzines and the Creation of a DIY Aesthetic. *J Design Hist*, 19(1), 69-83.
- Trott, B. (1999). Microsoft rivals blast software giant. *ARN*. Retrieved from http://www.arnnet.com.au/article/106311/microsoft_rivals_blast_software_giant/

- Turner, F. (2006). *From counterculture to cyberculture : Stewart Brand, the Whole Earth Network, and the rise of digital utopianism*. Chicago, Ill.: University of Chicago Press.
- Von Hippel, E. (2005). *Democratizing innovation*. Cambridge, Mass. ; London: MIT Press.
- Warde, A. (2005). Consumption and Theories of Practice. *Journal of Consumer Culture*, 5(2), 131-153.
- Wark, M. (2002). *A Hacker Manifesto [version 5.1: transitional version]*. Paper presented at the Media in Transition 2. Retrieved from <http://web.mit.edu/cms/Events/mit2/Abstracts/mckenziewark.pdf>
- Wert, R. (2009). We Told You Not To Hack The Electronic Road Signs, Didn't We? *Jalopnik*. Retrieved from <http://jalopnik.com/#!5141930/we-told-you-not-to-hack-the-electronic-road-signs-didnt-we>
- Zeller, T. J. (2006, 28 August 2006). Purple, the Color of a Legal Connipion. *The Nw York Times*. Retrieved from <http://www.nytimes.com/2006/08/28/technology/28link.html?scp=6&sq=%22stuart%20frankel%22&st=cse>

Appendix

List of projects

- 2004 **FIX**, appearing in the exhibition *There's a Hole in the Bucket*, curated by Spiros Panigirakis, CLUBSproject Inc., Fitzroy.

FIX consisted of a repair counter installed at CLUBSproject Inc. manned by a team of enthusiastic volunteers (Carly Fischer, Jophes Fleming, Starlie Giekie, Susan Jacobs, Marcus Keating and myself). The *FIX* team accepted objects for repair from exhibition visitors. Objects 'fixed' included an IKEA foot stool, a MatchBox car, and a desk lamp.

online at www.openobject.org/objectsinflux/?cat=5



- 2004 **Home-made wireless antennas**, appearing in the exhibition *mMa*, curated by Bianca Hester, CLUBSproject Inc., Fitzroy.

Developed to provide internet access to artist run space CLUBSproject Inc. the wireless internet connection piggybacked of the nearby Gertrude Contemporary Art Space network. A long range wireless link was established through the use of a 'cantenna', a directional antenna constructed from a pineapple juice can, and a parabolic reflector, constructed from cardboard and aluminium foil.

online at www.openobject.org/objectsinflux/?p=35



- 2004-2006 **B&O MP3 Mod**, winner of *The 2006 Great Mac Mod Challenge*, online at www.macmod.com.

The *B&O MP3 Mod* engages with the Macintosh case modding community. It consists of a 1998 Apple PowerBook computer housed inside a modified Bang & Olufsen case. The unit operates as an MP3 jukebox, the original B&O control interface is re-tasked to function as track selector. Software developed for the unit has been released under an open source license.

online at www.openobject.org/objectsinflux/?cat=2



- 2004 **Cactus door handle**, installed in my apartment.
Constructed from the arm off a wooden cactus
decoration found in hard rubbish.
online at www.openobject.org/objectsinflux/?p=24



- 2005 **Pokia mobile telephone handset**.
Originally designed by Nik Roope, the *pokia* style
mobile telephone handset is a popular modding
project. My version of the device takes an old
Telecom phone and adapts it for use with a Nokia
mobile.
online at www.openobject.org/objectsinflux/?p=21



- 2005 **Cylindric Ultrasonic Bat Detector**, appearing in
the exhibition *slave*, curated by Christopher LG Hill,
Kain Picken, Rob McKenzie and Nick Selenitsch,
VCA Galleries, Melbourne.
The Cylindric Ultrasonic Bat Detector draws on the
resources of bat interest groups and is based on DIY
bat detector plans down loaded from the internet. The
detector circuit is housed inside a re-tasked Braun
cigarette lighter designed by Dieter Rams.
online at www.openobject.org/objectsinflux/?p=16



- 2006 **iPodLinux**, using the iPod as a recording device.
Installing the iPodLinux software onto an iPod and
conducting tests to determine the effectiveness of the
unit as a recording device.
online at www.openobject.org/objectsinflux/?p=7



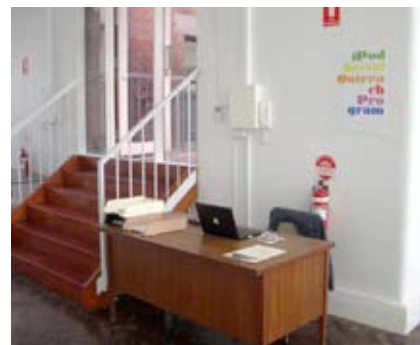
2006

iPod Social Outreach Program, appearing in the exhibition *Bartertown*, curated by Nadine Christensen, Uplands Gallery, Melbourne.

The *iPod Social Outreach Program* (iSOP) operated as a free repair centre for iPods. Repairs were carried out by myself, an untrained amateur and were informed by user generated information obtained from various internet sources. Based in a commercial Melbourne gallery, *iSOP* extended into the broader community through promotional posters, classified advertisements, on-line forums and articles in the local paper. Knowledge generated through the repair process was disseminated back into the online community through a dedicated project blog.

A number of DIY iPod accessories were developed for the project and exhibited along with instructions for their construction.

online at www.openobject.org/isop



2008

iPod Mash, appearing at *Sustaining Practices: Collective Commons Day*, CLUBSproject inc. Meat Market Arts House, North Melbourne.

iPod Mash involves a clash of eras, combining a 4th generation iPod, 3.5" hard drive, mixing circuitry and the case of an early '80s AKAI tape player, the unit operates as an audio mixing deck.

The *iPod Mash* was awarded third prize in *The 2007 Great Mac Mod Challenge*.

online at www.openobject.org/objectsinflux/?p=43



