INSIDE OUT: MAPPING MEDIA

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Belinda J. M Barclay (Bindy)

University of Canterbury

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Abstract

The orders of linkages that stabilise evolving media worlds are far from obvious. Often undertaken in media 'laboratories', the collaborative processes which combine a range of disciplines to develop media worlds are also far from straightforward. Enablers and constraints are as likely to be non-human as they are the people associated with the project. Plugs, wires, switches, protocols and standards - things whose detail can be mind numbingly boring - all have to be worked into effective and stable sets of associations. This thesis describes two knowledge pathways that track through such a project. The first describes the development of a prototype for a website, imagined as a portal for a range of interests around children and media in New Zealand/Aoteoroa. As media worlds are continually being reconfigured and as data circulates across increasingly linked access technologies, many non-government organisations are migrating their work to 'the web'. 'The Media Clearinghouse' project was one of these. Latour's analytical concept of immutable mobiles provides a way to make sense of some of the work observed whilst his direction to 'simply follow' worlds of interest provided the methodological challenge. The second pathway, traces the bibliographic threads of literatures that come from the descriptive genres of Science Technology Studies (STS). Significant amongst these are Leigh Star and Geoffrey Bowker who have elaborated the concept of boundary objects and infrastructures. Star and Griesemer's seminal description of the Museum of Invertebrate Zoology is compared with a description of an early laboratory by Bruno Latour. These and other writers elaborate on methods that offer ways to render visible the messy, chaotic performances of design and invention. They follow inscriptions - tables, lists, maps, sketches and so on. These things work between the micro and the macro and enable very huge terrains to be assembled in small, ordered spaces. The thesis assembles a list of methods that have some utility for following and describing web design work and perhaps, other information worlds. Having followed and described this writer's work through the invention of the prototype it is argued that a combinative method has successfully enabled a description that moves in and out of a new information 'laboratory'.

Introduction

"The work of doing science still takes place substantially off line, even though electronic communication and data sharing aspects are becoming increasingly more important. Even parts of the work that may be isolated as "information work" are not necessarily conducted via electronic media: People talk to each other, they run down the hallway, write things by hand in notebooks and on labels…"

(Bowker and Star, 2001, p.4)

Who hasn't bent a paper clip to some untoward end?

(Alder, 2007,p.81)

Working Design

In its design stage, the character of an object is endlessly debated (Callon, 1991, p.136). Nothing about its eventually stabilised character is fixed and every aspect of the *form* is potentially transformable. The work of assembling multiple and heterogeneous elements is intensely creative and fraught with risk and frustration. This is particularly true for twenty and twenty-first century information communication technology (ICT) industries where design and production tend to occur as simultaneous practices (Girard & Stark, 2003). In such work places, all the design team are looking for multiple strategic fits from often highly innovative hybrid solutions while at the same time, the resultant ICTs require highly structured and standardised sets of protocols *in order* to connect and allow content to travel.

As attempts are made to create near seamless access to multiple worlds and their associated digital and non-digital collections, constant actions, flows and disjunctions of ordering, by humans and non-humans are becoming ubiquitous. This "databasing [of] the world" (Bowker, 2005), collaboration between for example, digital archives, repositories and libraries, together with meta information 'scapes'[1] are weaving 'operational cultures' (Mackenzie, 2005). These circulate between 'networks' of ever burgeoning 'communities' of users and producers. Such 'multiplying machines' (Miller, 1997) of practice "teeming with an abundance of relations" (ibid, p.355) represent new challenges to researchers who might wish to make sense of the apparent chaos and the irrefutable influences of their outcomes. To make sense of these many trajectories is not to sum them up. Perhaps a more fruitful research path is to pragmatically render visible the "continuous connections" (Latour, 2007b, p.7) between the various versions of particular innovative projects.

This thesis is an attempt to undertake some work of this sort. Its descriptions weave[2]

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[1] Google is the most obvious but not the only example.
[2] Weaving is a metaphor that has continually proved useful throughout the research. This researcher's background includes a design degree in Textile design and this has significantly informed her use of this. Bowker and Star comment of the utility of this metaphor for 'sorting things out' (2000)

together observations of an attempt to assemble a prototype website, 'The Media Clearinghouse', and a description of *this* researcher's attempt to learn and to practice a reflexive, combinative method developed from a 'suite of tools'(Kaghan & Bowker, 2001, 262), largely informed by the methodologies of Actor Network Theory (ANT) and Science Technology Studies (STS). It specifically outlines literatures that trace from Library and Information Science and those of Laboratory Studies. Thus the text articulates two progressive transformations, the dual knowledge making pathways (Latour, 2007b) of the invention of the Clearinghouse and the collection of a research 'toolkit' (Latour, 1999b) with which to observe it.

In one sense, the thesis is all about collecting, performed as both verb and noun. The collection of people and objects rendered a new world, a collection of methodological practices and analytical tools were assembled to describe it. From all this collecting, hybrid assemblages, mixtures of various elements from worlds having variably stable connections, worked to create the two projects. Between the two circulated this writer's own shifting hybrid associations as student/researcher/librarian-mother/community advocate/designer. Ordered in time, the prototype project came first but quickly proved to be a topic 'worthy' of the task for hybrid research work (Latour, 1996, p.ix). The narrative descriptions of Section Two introduces her first in Chapter 4 as The Chair of a community group, The Childrens' Television Foundation (CTF). She is re-introduced in Chapter 5 as a Librarian/researcher grappling with the task of designing a web infrastructure. Her struggle as researcher for a thesis is described in Chapter 9, *'Practicing Reflexivity'*. Of course this Librarian/researcher is just one of a multiplicity of actors whose efforts 'comingled' (Miller, 1997) to 'get the job done' (Girard & Stark, 2003).

Mapping Laboratory Studies

The thesis begins, in somewhat more normative genre, with a comparison of two early papers by key writers from ANT and STS that have been variously used to inform observations around contemporary 'new media laboratories' and information infrastructures. *Give me a laboratory: and I will raise a world* by Bruno Latour

(1983) is compared with Susan Leigh Star and James Griesemer's *Institutional Ecology: 'Translations' and Boundary Objects: Amateurs and professionals in Berkley's Museum of Vertebrate Zoology, 1907-39.* (1989 , p.393). Although the two papers are not commonly associated, this thesis will argue that between the two descriptions of pre-digital scientists circulate references of boundaries, standardisation, movement and the collaborative properties of 'working' differentiated interests through innovation. Literatures that trace back and forth to these two papers are then reviewed in relation to worlds of contemporary ICTs.

'The Media Clearinghouse' project could be said to have performed very much in keeping with Star and Griesemer's definition of a 'boundary object' which they introduce via a description of the collection of specimens and creation for the Museum of Invertebrate Zoology, California. Like Joseph Grinnell, who established that collection, the Clearinghouse was conceived as a new information service which would attempt to mobilise a range of socio-technical networks around a collaborative space, maintaining the autonomy of each and satisfying the informational requirements of each of them (Star & Greisemer, 1989, p.393).

At its most simplified, the project was an attempt to map a complicated assemblage of related worlds. To create a 'virtual' map, representing regulatory terrains and media worlds through headings and sub headings, The Clearinghouse as intended to perform as a new public space for communication about media worlds working in and out of New Zealand/Aoteoroa. The goal was to make a 'space' that could render visible connections and associations that worked regulatory, production and user practices of the "children's media environment specific to New Zealand and the Pacific" (Zanker & Barclay, 2004, p.3). The more complex vision was to migrate the kinds of co-operation already working through off-line forums and to create new opportunities for exchange afforded through the translation of communication into a virtual space. In doing so the project was attempting to mobilise new technologies to reconfigure the ongoing co-construction of media worlds – regulatory, entertainment, informational

and educational.[3]

Arrangements of digital content, text, images, audio and video files, links to other parts of the web space and links to other web spaces were stabilised into an ordered infrastructure. Assembling the site required collecting the means to build it (mapping tools), the means to locate, disseminate and enable access to it (web services) and the means to promote its use (business resources). Akin to Grinnell's classification system for translating the fragile invertebrate zoological populations of California into a stable museum collection, the dream for the Clearinghouse was to create an infrastructure through which various, heterogeneous worlds that operated diverse regulatory regimes could associate.

Latour's *Give me a laboratory...* paper describes how, in early twentieth century France, Louis Pasteur managed to connect the microbial properties of the disease anthrax with the interests of the agricultural sector. Of particular interest for this research was Latour's discussion of how the ideas, seeded 'inside' the laboratory, travelled beyond its bounds, 'outside' and then, back and forth between these sites to enrol and thus realise the project. The 'Media Clearinghouse' project was not dissimilar to Pasteur's in that to enrol support for the idea, its innovators first had to create something that could lever small enrolments which in turn could be magnified in their 'laboratory' into a realizable website.

Chapter One also draws a parallel with Howard Becker's work around the 'mapping' qualities of research inscriptions and 'brings the laboratory forward' in preparation for a discussion of recent literatures in Chapter Two. It also draws threads through to the more recent writing of Latour and Star.

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[3]In looking for words to describe the worlds, this list, quite unintentionally replicates the 'Reithian' mandate from which much of the public service impulse for media provision evolved. The extent to which such co-operation is effective in a deregulated environment as a mix of self regulation and regulatory regimes is a matter for continued debate not afforded in this work. For a list of resources to explore this debate see http://www.mediascape.ac.nz/content/research/new-zealand-research/political-economy.

The analytical concept of 'immutable mobiles', first detailed by Latour in *Science in Action* (1987), describes how translation and transformation occur as movement between things with contradictory properties. This thesis suggests that this concept of immutable mobile has some utility if combined with the concept of boundary object. It is the flexible, mobile yet bounded properties of worlds or things that each attempt to capture through description of their movement.

In Chapter Two, bibliographic terrains that increasingly draw on the work of Latour and Star are explored. Concepts introduced in the first chapter are then followed into descriptions of contemporary information worlds by Girard and Stark, Adrian McKenzie, Lucy Suchman, Steve Woolgar and Nancy Wakeford. This literature reveals that 'new media technologies' make for worthy domains of inquiry. In such worlds expediency and improvisation are the realities of strategically planned development where simultaneous production collapses into heterogeneous processes of endless reconfiguration and 'workarounds' (Pollock, 2005). What is required to describe these worlds and their "hybrids that appear able to mix anything" (Strathern, 1996, p.531) proves to be a hybrid method.

As for the students in Latour's hybridised genres, who narrate the method of 'actor network theory' for him[4], *this* writer, has learnt that to render a 'good enough description' of worlds which are changing fast, new topics with "terribly fuzzy boundaries" (Latour, 2005a, p.142), one necessarily narrows the focus. Since such worlds lurch along complicated, multiple and simultaneous trajectories that work 'provisional facts' into being (Latour, 2007b) a good description requires new language, or rather, new meanings to some familiar languages. The packing of 'worlds into words' (Latour, 1999b, p.24) means redefining some old sociological favourites and dispensing altogether with others. It seems that this successive layering is how to 'do' sociologies of worlds that do not progress with 'elegant orders' (Latour,

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[4] Specifically Norbert in Aramis (Latour, 1996) and the Student in "On the difficulty of being an ANT: an interlude in the form of a dialogue" (Latour, 2005a)

1996, p.72). Section One thus concludes with a list. A methodological 'tool kit', it details methods and concepts that might be useful to other researchers following similar domains.

Describing Design

The three chapters in Section Two describes in a third person narrative genre how The Clearinghouse designers wrestled with numerous unknown things to build their site. The story of The Clearinghouse is a story of invention. Not "invention" in the sense that it is fictional but rather, everything in its description required some kind of innovation, some hauling together of people and objects into new or reconfigured associations to render an idea 'real'. Becker observes that sometimes a collective activity is something that no-one wanted but is the best everyone could get out of the situation (Becker & Pessin, 2006, p.281).

Though destined for a digital space The Clearinghouse was not in fact born digital. It was born of sketches on whiteboards and little paper post-its stuck on a filing cabinet wall. From inception to the eventual 'presentation' of The Clearinghouse on big screens via data projectors, the effort to produce a reality from an idea was characterised by disjunctions and disruptions. Local problems, such as a poor fit between data stick (a new 'thing' at the time) and the usb port located on the back of the hard drive, or the (eventually unsuccessful) attempt to collaborate on building a functional database for the site content, were the 'reality' of 'getting the job done'. As a new thing, The Clearinghouse makes for an excellent world to explore and describe in order to pursue a 'sociology of the possible' (Becker & Pessin, 2006, p.279).

The jumble of effort to make dreams real needs a place to cohere - a "laboratory" in which to align, sort and assemble, to test and trial, break and reassemble the minute and intricate parts of a newly invented entity. It is this assembling and building that is rendered here. It is a description of a hybrid research/advocacy world that became a design world for a prototype. A prototype is of interest as something that is real but at the same time not yet realised. Of particular interest for this description is how such

an apparently stable entity was rendered out of an idea - how a world was built to see it through to 'completion'. From a moment of frustration, a "want of a satisfactory thing for doing what [was wanted to be] done" (Petroski, 2006, p.1), an idea was hauled into being, first as the prototype and eventually as a 'real' website. What was 'wanted' was an infrastructural communication device, a kind of virtual 'table' for some diverse interests to gather around.

The description is less concerned with what the researchers were trying to do than how they did it. To tell 'the whole story' would require a rendering in something close to real time and in such detail as to be mind numbing[5]. Other literatures that describe the worlds the work sought to map are provided through references and footnotes. In this relatively short document, whose length is prescribed by the rigour of the academic discipline to which it is attached, it was not possible to account for the incredible detail that rendered the graphic interface or created the content of the site. Such matters and the associated issues of usability and performance of the site itself are worthy topics for future descriptions.

Explored in retrospect, enabling as Latour would say, 'retroactive certification' (2007b, p.7) the description traces back along the chains of translation that folded the socio-technical worlds of audiences, regulatory agencies, research and media into an assemblage of coded texts and images ordered and, arranged beneath, a set of labels laid out as a web navigation and infrastructure. Once 'finished', burnt onto CD and accompanied by a proposal document written in business genre, the prototype was a mix of imagined content and stable, endurable design elements. Digital objects, made specifically to attract support and not intended to live beyond the prototype, were embedded into pages that 'hung', via coded instructions, to the hierarchies of the navigation structure (links to nowhere signaling bigger global dreams).

Whether they are being observed or not, worlds act and there are no neat endings.

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[5] Or as Star refers to such backgrounded work as, boring things that generally have a very low profile and which most people would find dull (Star, 2002).

Observers must, for purely practical reasons, stop their accumulations somewhere and attempt to reconceptualise the action in reflexive description. In doing so, they recount some retroactive objectivity and establish connections between versions of things. Continuous outcomes, chains of action that, in their passages of association, are characterised by successive uncertainties can only be 'seen' after they have travelled their paths of experience. Until then their variable scales, discontinuities and successive reconfigurations present an intensely subjective and chaotic picture.[6] Even in retrospect, there are not necessarily any neat endings but simply an accumulation of more or less objective understanding.

Unlike Latour's *Aramis*, the dreamt of but never built transportation system for Paris (1996), The Clearinghouse prototype was completed and taken out from its 'lab'. The prototype circulated through an array of potentially interested agencies. Sponsorship was secured through a unique collaboration between four agencies: The Broadcasting Standards Authority (BSA), a quasi-governmental regulatory authority; The Advertising Standards Authority, a self regulatory agency; The New Zealand Broadcasting School, a tertiary education institution and the New Zealand Families Commission, an autonomous crown entity. A web site, 'realised' from the prototype's design, was launched in the then New Zealand Parliament Buildings by the Minister of Broadcasting as "Mediascape".[7]

Practicing Reflexivity

Latour says of his description of *Aramis*, "everything in this story is 'true', but much of it may not seem plausible (1996, p.x). This implausibility of description emerges in part because of the difficulty of cutting research lines through the work of invention. Instead of drawing neat lines of inquiry around the outside and getting a good 'fit' with the shape of the thing, reflexive description involves opening out the mess which

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[6] This presentation of knowledge building as retroactive certification which challenged the epistemic stance that builds bodies of knowledge is the theme of several writers 'collected' under Science Technology Studies. See particularly Latour (2007) and Suchman (2002).

[7] The site sourced now from the url www.mediascape.ac.nz is a further iteration from the one launched

works any new thing out of a myriad of possibilities. Invention is not done through linear, neatly seamed processes. Capturing the endless variables that built, first a 'site' for design and then design of the web-'site' itself required describing processes laden with things in socio-technical chains of multiple, overlapping interactions (Vinck, 2003, p.75). Elements and disciplines were hobbled together by people not experienced in design and held there by objects not intended to be associated for that purpose. The project had to wrangle a set of undefined problems into a set of specifications for itself and then begin to solve them. Processes are characterised by forward momentum underpinned by uncertainty. There is no way to anticipate what will hold, what will stick or what will need to be sacrificed. The strength of the connections grows and shrinks depending on the shape of the evolving design that is delicately balanced, nearly there, but still easily disappeared.[8]

A third and final thread weaves lightly through the thesis and is a worthy topic for further research. While the methods described work well for studying the *work* of innovation, the impetus, the moral ordering by the researchers who invented the Media Clearinghouse, to act on behalf of "children and those who care for them" (Zanker & Barclay, 2004) is perhaps better addressed with reference to the notion of assertions of orders of worth. The analytical concepts of Boltanski and Thevenot (1999) which they term 'A sociology of Critical Capacity', enable some classification of the civic 'worth' of the project. Although this work does not fit neatly into the ANT/STS repertoires, its emphasis on the enactment of differentiated and disputed claims which can be mapped to categories of people and the mobilisation of those claims through the ordering of people and things makes it a valid elaboration to the discussion of boundary work. This moral ordering might be considered another actor that participated in the intricate associative work of collaboration that worked the site.

Section Three comprises a further two chapters, a reflexive conclusion to the work. Chapter 8 marries the methods and their literatures with the observations of the work.

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and has developed along a chain to which this author was no longer strongly attached.
[8] Latour describes Aramis as able at one moment to be reduced to pile of paper or destroyed by a puff

This conclusion suggests that the researchers assembled and worked into being a set of boundary infrastructures that could align and aggregate heterogeneous sets of regulations, standardisations and protocols that were themselves in fluid processes of negotiation. It asserts that in the worlds of this description at least, the analytical concept of immutable mobile has some utility if combined with the concept of 'boundary object'. The post-its, significant characters in Chapter 4, a workaround configured by the researchers to order the classified worlds familiar to the researchers performed as immutable mobiles. These enabled the fragile categories to move and cohere. As flexible labels, this dynamic action, a design workaround, enabled the Clearinghouse to be stabilised as a boundary object. The dream was that it would be naturalised into the infrastructures of New Zealand/Aoteoroa media worlds to become an effective infrastructure itself.

Entitled *Practicing Reflexivity* Chapter 9 is an assemblage of observations from 'inside' the research process. It describes, in first person narrative, the experience of following the methods that followed the work and traces along some of the knowledge pathways of working *this* text into being.

Characterised as they were by hybridity, heterogeneity, plurality, simultaneity, chaos and mess, this thesis does not aim to neaten any edges or iron out any creases in the design processes described. Rather it seeks to equip the reader with a set of 'tools' to take forward into the reading of description, and perhaps, if they deem them worthy and successful enough, to take out to other terrains and test the utility of their combinative methods.

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of air. (Latour, 1996, p. 143)

Section One: Laboratories and Boundary Work for ICT design: the literatures

"What is relevant is the short circuit established between the many groups usually uninterested by what happened inside the laboratory walls and laboratories"

(Latour,1983, p.43)

1. Inside Out: Two Early 'Laboratories' of Invention

As interdisciplinary endeavours proliferate so too has the nomenclature of the "lab". No longer limited to "scientific" invention, it might be argued that all sites of creative endeavour leave traces which can best be described through the metaphor of the laboratory. The laboratory as a typical organisation of the "knowledge society" is being revived as a topic of research interest (Vinck, 2007). The ability of a laboratory to "reconfigure entities from the natural and social world" and to merge, redirect, transform and settle in new configurations of pre-existing socio-technical entities (ibid) makes the re-presentation of the work undertaken through them worthy of observation and description.

This chapter compares two papers which each have long pedigrees that weave in and out of Laboratory studies, Science Technology Studies and studies of information and knowledge infrastructures. The first paper, *Give me a laboratory and I will raise a world* by Bruno Latour (1983), describes the work of the nineteenth century French scientist, Louis Pasteur. Its focus is in tracing the shifting scale of interests that circulated between the laboratory explorations into the microbial properties of the disease anthrax and their passages out and back again into worlds initially not enrolled in these efforts. As a result of their attachment, and from Pasteur's work in the micro-world of his laboratory, macro-shifts, not able to be anticipated *a priori*, occurred in agricultural production.

In the second paper the work of an early twentieth century scientist, Joseph Grinnell, is described in a short paper by Susan Leigh Star and James Griesemer. *Institutional Ecology, 'translations' and boundary objects* (1989). Joseph Grinnell, a zoologist, sought to collect and classify as many specimens as possible of invertebrate animals that he considered were threatened by the changing land use in the merging 'state' of California. Star and Griesemer first critique work by Latour's colleague Michel Callon. They then argue the utility of an ecological approach, where standardised methods of collection and inscription, such as those Grinnell invented at the Museum of Invertebrate Zoology, act to facilitate cooperation at the boundaries of diverse

communities. They argue that such boundary objects allow potential conflict to be managed in order that divergent groups, already in existence and with common interests, can negotiate some coherence.

Two Science Descriptions Compared

Although subsequent works by their authors intertwine in later Science Technology Studies Literatures, these two papers are not usually considered alongside one another nor considered to belong to the same methodological stable. Indeed, as the latter is in part a refutation of the methodological thread of the former, it is a bit of an oddity to suggest they can be satisfactorily combined. While both pieces speak of translation as key processes of action each potentially reaches different conclusions that tend to have potentially divergent implications for research methods. This chapter will suggest though that there is useful commonality between the two descriptions. It first traces the threads of each paper and then follows them to some later works of their authors that further demonstrate the convergence.

It is certainly curious that a comparison between two papers, written and published around twenty years ago, about middle aged, male scientists from eras which well predate the invention of information communication technologies (ICTs), can be argued to have utility for a study of twenty first century ICTs. Why did both Star and Latour go back to the early twentieth and nineteenth centuries (respectively) when seeking to reversion traditional sociological inquiry so as to better explain contemporary, multiple and heterogeneous networks? Although Pasteur and Grinnell were each working - innovating even - in periods of intense knowledge expansion, neither could have imagined a globally connected digital knowledge landscape.

Two main conceptual themes circulate between the two papers that have some utility for researchers trying to illuminate how technological innovation in the twenty-first century is being done. The first is the means through which to work divergent groups where multi-disciplined interests must necessarily collaborate or be enrolled into some project or other that has no existing precedent. The second is the extent to which

this work occurs "inside" or "outside" sites of innovation and the ways in which its associative practices travel between specific and generalised worlds. What is important for this chapter is not the outcome of each man's science. Rather, it is the inscriptions of the other scientists, the social scientists, Latour, Star and Griesemer that render mobile methods of description that have acute utility for contemporary inquiries of innovative work. This thesis argues that although Star and Griesemer achieve less in their description than Latour, nevertheless, a description that draws on their ideas would be a richer one.

Latour's paper suggests that invention dynamically circulates between the laboratory and the interests it enrols and has even more worth if, rather than describing things travelling back and forth, in and out of the laboratory, a description illuminates those things effected along the chains of association between them. Latour partially defines some concept of boundedness, in his method of explanation. The referents 'inside' and 'outside' are points of translation along chains of interaction. Significantly though, things move freely and dynamically in and out and are continually configured and reconfigured by unpredictable and incomplete translations. For Star a tighter concept boundedness is essential, tracing back to ethnographic and ecological notions of community and belonging[9]. Importantly though, like Latour, she seeks to undo the idea that boundaries are in any way static or predictable. Perhaps the commonality between the two is best understood by explaining that Star and Griesemer are interested in following the configuring of shared domains that are part of the chain of production of new things that gives weight to the collective effort of these. Latour gives more weight to the configuring of the trajectories of products of which collaborative effort is a part. This thesis suggests that a methodological marriage of the two is in practice an elegant amplification of their similarities.

Michel Callon, with whom each of the papers is explicitly or implicitly associated,

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[9] For this writer such tracing boundary literatures invariably leads back to Anthony Cohen's small but important book "Belonging" (Cohen, 1982) where difference is articulated to be a crucially defining factor in identity production. Although ANT in part undoes such fixed nations of 'identity' this thread of definition at the boundaries of difference is worthy of future exploration.

claims "there is no inside or outside" (Callon, 1991). Symmetry of description naturally conflates such dichotomous boundaries, considering rather those socio-technical networks and associations that order and build simultaneously through actions and thus construct context as much as being constructed by them.[10]

In their paper, Star and Griesemer describe the creation of the Museum of Invertebrate Zoology. Between about 1908 and 1934, Joseph Grinnell, with associated patrons, sought to collect, catalogue and preserve zoological life against the pressure of ecological adaptation. The paper focuses on the simultaneous shaping of Grinnell's research goals for a repository of vertebrate specimens with his mobilising of a "network of collectors" (p.516). This process necessitated the intricate management of potential conflict and "incoherence" between collectors, theorists and professionals which Grinnell effected by inventing, "propagating" and "skillfully managing" standardised methods that were able to reach across the divergent worlds of the participants who brought differing yet related visions to the project. Star and Griesemer argue that consensus is not necessary in scientific endeavours and is in fact mythologised in many accounts of scientific work. Indeed, through the boundary work of inscription, enabled by the systems of recording such as those initiated by Grinnell, collaborative effort is achieved without the need for agreement across the project.

Star and Griesemer take as their starting point the models of Latour, Callon, et al detailed in Callon's seminal piece about the scallops and fishermen of St Brieurc Bay (Callon, 1986). In detailing the struggles between the actants of the Bay, Callon draws lines (literally by using diagrams) along which transformation flows. The labeled processes of a translation observed out of this empirical case: problematisation, interessment, enrolment and mobilisation, are redrawn by Star and Griesemer to a diagram that summarises Callon's "funneling" model where, translations in the action must be mapped via a presupposed 'obligatory passage point'. According to Star and

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[10] Writing with Rabeharisoa (2003) Callon asserts that the entanglements and co-operation, between researchers in the wild and researchers in the laboratory produces and elaborates new and sometimes

Griesemer, one view, usually that of a manager, is selected as the perspective from which the multiple translations of the story are told. Star and Griesemer critique this model as reductionist and posit instead an 'ecological' model which affords "many to many" mapping of interdependent cohering actors.

Key to this seminal text is the introduction of an analytical concept: the boundary object. For Star and Griesemer a boundary object is a concept of:

> "those scientific things which both habit several interacting social worlds…and satisfy the informational requirements of each of them. Boundary object are objects which are both plastic enough to adapt to local needs and the constraints of several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly constructed in common use, and become strongly structured in individual-site use [and] may be abstract or concrete" (p.393)

Their point is that coherence and collaboration around a boundary object are the significant processes that manage conflict and bring allies to points where translation can effect further coherence. Opportunities and outcomes of such processes are infinite and cannot be reduced in any empirical study to just one point of significance. What is required is an examination of the multiple associations that somehow draw together and hold divergent groups.

In describing how Pasteur went about discovering the microbial properties of anthrax and, in doing so captured the interest of previously indifferent groups, Latour argues for a sociology that follows movement. In laboratories, Latour argues, differences of scale, seemingly so crucial to the 'composition of the social context' are made irrelevant. Through this 'flattening' trials and experimentation render the invisible visible and are thus able to create new things. If these small scale, fresh sources of new strength or competencies, manage to travel beyond the laboratory and multiply, through a myriad of translations, into unanticipated associations, then they can solve

unimagined knowledges.

potentially large scale problems. In the case of Pasteur the attachment of the microbe to France's anthrax epidemic transformed the French agricultural industry by offering a way through the problem via microbiological solutions.

Most important for those who follow scientists by Latour's methods is to avoid the notion that 'there is a time when innovations are in laboratories, and another time when they are tried out on a new set of conditions which invalidate or verify the efficacy of these innovations' (p.155). Rather than a perspective that fixes on the objects and boundaries between groups, interests or action, Latour's focus is on the flow and alterations in and out. In a sense his argument might be said to negate the fixed notion of conflict inherent in the construction of Star and Griesemer argument. For Latour, since little is fixed and all can be rescaled by moving it in or out of the laboratory, or in or out of the worlds beyond it, difference is a matter of location, not perspective.

This is a key incompatibility of the two papers. Although Star and Griesemer do make the disclaimer that in a short piece they cannot detail all actors, their paper ascribes life and action to the "recalcitrant animals" and their habitats (p.511). But their description falls short of the richness of symmetry which Latour affords the actors in the story of Pasteur and the microbes, or for that matter, the symmetry of analytic view which Callon asserts as the goal of the Brieurc Bay piece.

Unlike the case of the Brieurc Bay, where collective action failed and controversy led to a "silent mutiny of scallops and fisherman" (Callon, 1986, p.220), the efforts of Grinnell and his allies were resoundingly successful and the Invertebrate Museum lives on today. But can Star and Griesemer be considered to be equally successful? There is a paucity of detail in their description which reads as though they are leading the reader through the very "obligatory passage point" style of analysis they seek to avoid so that symmetrical description is not wholly achieved. Grinnell is centralised in the research in a way Latour avoids. Whereas Star and Griesemer define the differing commitment as phenomenon that require the creation of standardised interfaces that minimise or even erase conflict and facilitate the progress of shared 'visions', for

Latour these differences of interest provide the very impetus that mediates the scale of transformation. Grinnell hoped to stabilise interest in order to protect. Pasteur was stabilising an idea. In the end what is being stabilised are concepts, beliefs and opinions of how things might 'be done' but these can only be stabilised by enacting them using concrete, objectified performances that are captured in inscription.

While neither paper gives great weight to this last point, their 'infrastructures' of action would become the legacies of both. The articles are also apparently very different in their assessment of how to follow their actors. Star and Griesemer stress the differences between interests and the suppression of conflict in favour of the assertion of common understanding and compromise. Divergent visions are worked on to elaborate the goal of establishing a comprehensive and new collection. It is both the collection and the collaboration that created it that represent the 'ecology' of the boundary object: Grinnell's classification system.

Read differently is there a great difference between Star and Griesemer's claim for the diminishing of conflict through Grinnell's boundary object and Latour's revelation of where the strength of the laboratory (Pasteur's) is to be found? Both assert the experimental nature of work in newly created sites, of going out and bringing back the raw "materials" from which to create new things that in turn effect political purpose. For sure, Grinnell is re-presented as aware of his connection to a political will for capturing species at risk in a catalogue of record whereas Pasteur was just following the unseen connections until he was able to reveal them. It was this new knowledge that then interested and enrolled political change agents.

Yet perhaps to become too concerned with exactly where 'boundaries' of innovation are drawn is something of a methodological red herring. Boundary objects are not 'objects' at all. They do not presuppose borders but are a dynamic product of the working of interests across them. They are the things around and through which differences can be mobilised and may or may not take concrete form.

In a sense both writers were inverting scale. Latour's detailing of this change in scale

and its consequences is the point of his article and Star and Griesemer might well have borrowed some of this idea to add to description. Grinnell, in mobilising others, inverted the scale of interest from identifying to collecting and by doing so, made visible the intricate work of classification. For Latour, collection and classification were not brought forward, since this was not so much the interest of Pasteur's work. Yet it could be argued that, in part, Pasteur's process was much the same as Grinnell's. Although perhaps a less dynamic perspective than Latour would condone, Star and Griesemer might describe Pasteur's laboratories (in Paris and on the farm) as highly complex boundary objects which could work the divergent visions of farmers and politicians in order to solve the mystery of anthrax. Latour in turn does not need the narrative descriptor 'ecology' since the very interconnectedness that term describes is the dynamism Latour observes working all socio-technical connections.

What is to be gained from this comparison? Both papers might be said to have a common interest to privilege the process of knowledge building as something that cannot be separated from the knowledge itself and, in doing so, undo assumptions that scientific practice and its consequent knowledges come neatly bundled in lineal orders. Though using different languages, each has an interest in making visible the intricacies and back-grounded nature of the interactions of people and things which formulated new 'informations' through detailed description of inventive work. By locating their inquiries both 'inside' sites where the assemblage of new understandings were trialled and rendered standard and 'outside' where those knowledges were realised by associating interests to them, each simultaneously undoes assumptions about the lineal nature of discovery and asserts the importance of what might be summarised as infrastructures of association.

Following laboratories: a worthy task?

Is it possible that inventors of contemporary information infrastructures can gain from observations of the practices of scientists, written by practitioners of Science Technology Studies, all of whose work predates the web? Could it be that what is said to be the effect of "new media' web connections actually has some roots in the

emergent knowledge building technologies of earlier, pre-digital periods?

Physical sciences increasingly recognise that the "rules" once fixed for the description of the action might not quite be adequate for the task. Similarly, theories of the social, thought to explain why people go hungry or money circulates, also struggle at times to "fit". Bits of description protrude from neat boundaries of re-presentation and more often than not raise more questions than their neatly packaged "arguments" can answer.

Early sociologists were conscious of the importance of making visible the linkages between their sites of interest and their observations. Co-incident with the emergence of industrial work practices, an accent on process and linear order prioritised well articulated detail so that an argument might be considered substantiated. Over time, these carefully detailed studies became reified and began to stand alone as theory (Braverman, 1975; Kerr, 1973). No longer necessarily associated to the sites of their inquiry to argue class or stratification, exploitation or domination, was to communicate, without need for detail, a trope of meaning onto which further observation could be elaborated. Specifities of locality explored about the social served to strengthen already 'proven' theory. Researchers of the social came to believe that the worth of their practice could be measured according to the degree to which their observation could fit the frames of social theory. Social facts were those things that could be demonstrated to have such adequate theoretical fit.

Although their inception was co-incident, emerging from the great period of inquiry and wondering of the sixteenth through eighteenth centuries, social and physical sciences diverged in process and practice. Eventually, while physical sciences continued to expand their terrains, social sciences discovered their explorations had reached some crucial limits. Some of the theories of social science were rarefying to the point of extinction, no longer adequate to describe highly flexible worlds under observation or to explain the innovations of science and technologies with which the social engaged and mingled.

Some would suggest that sociology follow the 'post' line of development. This rhetoric neatly solves the out-moded tendencies of past theory and allows the threads of them to permeate new discussions by loosely tying old labels to identified shifts in economic and productive practices: post - industrial became post-fordist which became post-structural, peppered with a tinge of neo-Marxism and most latterly post-Foucaldian. Other rhetoric employs a linear, temporal historicity that follows a series of 'revolutions', each has an associated 'age', characterised by identifiable features of technological and social practices. The Enlightenment - 'he' who had enlightenment held the key to the future; Scientific - he who could master science could rule; Industrial - he who owned the industry owned the power, knowledge - spurned by the proliferation of technological connectivity meaning knowledge became power - he or she who controlled content became king. Now a Creative 'revolution' is supposedly characterised by the rise of the creative classes who, caught between opportunity and exploitation, have evolved and enabled new media technologies. Creativity and imagination, afforded by connection and information, are the currencies of power and exchange.

Now a collapsing of bounded orders of investigation is accompanied by a heightened interest in multidisciplinary collaboration. Discussions are becoming rich with debate of how "discipline" might give way to hybrid forms of research and action. This interest in how the work of collaboration between apparently separated entities is described raises interesting questions for researchers. Science Technology Studies (STS), a kind of umbrella label for research interested in 'networks' of technologies, people and things, seeks to improve on the descriptive capacities of 'traditional' sociologies. Description that allows some discontinuity may indeed afford a better 'fit' that makes recognizable the complex heterogeneities, the inevitable relative "messiness" and relative (Law, 2004, p.18; Star, 2002, p.19) characteristics of terrains of interest. This sets up the notion of "discipline" as a series of "commitment[s] to engage in disagreement" (Star, 2002) out of which new knowledges, different orderings of understanding, may emerge. Such description also re-opens opportunities to describe the work of scientists and engineers by detailing simultaneously the dual knowledge building pathways of their discoveries as well as

their accumulating knowledges about the methods of discovery itself.[11]

This view works well for those interested in describing innovation. New projects do not exist at the outset (Latour, 1996, p.23). To haul themselves into being they need to mobilise knowledge from a range of sources (Strathern, 2004, p.21) and balance multiple interpretations. The outcome, a 'dreamed' world, is in the future, endlessly debated (Callon, 1991, p.136) What renders a project 'real' is the fixing of associations across and between disciplines, until there is something that assembles and, hopefully resembles, the vision. Representations of the work of creation of new knowledges can be most accurate when, rather than imposing preconceived notions from beyond the terrain of interest, the research follows the references that circulate around a project,[12] observing what associations are effected, what strategies are attempted, what holds, what fails to be enrolled. Further, this work of 'fixing' inevitably involves some ordering; listing, recording, classifying (Star, 2002). By paying attention to this "hinterland" (Law, 2004) of inscriptions and the devices which effect them it is possible to trace back and forth along the chains of association and render visible the sense and order within the apparent chaos of the work of innovation.

With this evolution of the 'social sciences' in mind, the above comparison of the descriptions of the efforts of Grinnell and Pasteur allows us to see that both required standard, replicable processes which relied upon and were traceable through inscription to effect their work. What moved between the variably stable organisation of people and things, perpetually reconfigured around the myriad of interruptions and constraints is what invents new territories and domains. To discover the value of the descriptions and the analytical concepts used in the two papers reviewed it is necessary to extend the comparison beyond those descriptions and then follow their bibliographic trails out along the threads of analysis embedded in the publications that came after them.

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[11] Latour has elaborated this argument as proposed by Whitehead. (Latour, 2007b)
[12] This is a concept drawn from Latour's chapter "Circulating References" in *Pandora's Hope*(1999b).

Bibliographic Traces

What each observer in the papers reviewed above used to trace the work that is described were the artefacts that were produced by it. This comparison suggests that Star and Griesemer could have made much more of the catalogue – still in use at the time they wrote their article,[13] Latour might have followed the chain from Pasteur's experimentation as far as the inscriptions for regulatory practice and testing that ensued. In subsequent descriptions, this is precisely what each did. Having begun the exploration of scientists and their laboratories with Steve Woolgar in *Laboratory Life*, a detailed ethnography of a laboratory, Latour subsequently wrote Science in Action, which describes precisely the micro movements, including those of inscription, that connect the work of scientists and their efforts in laboratories with their networks and allies that accumulate along the chains of invention. This literature evolved Latour's ideas regarding observation and culminated in his association, with John Law and Michel Callon, in the formulation and description of the pragmatic methods of 'Actor Network Theory'. (Callon, 1986, , 1991; Latour, 1999a, , 2005b; Law, 2004; Law & Hassard, 1999). Working along a related trajectory Leigh Star's subsequent work, which details the 'background work' of ordering, often with specific reference to scientific and medical endeavours, is strongly embedded in the literatures of Science technology Studies (STS).[14] Commonly cited, *An Ethnography of Infrastructure* (Star, 1999) details how to research the associations that connect science as a way to render visible the knowledge it produces. With fellow information specialist Geoffrey Bowker, she wrote '*Sorting Things Out*", a seminal text which, as an ethnography of sorts around the International Classification of Diseases, summarises the interest of STS, particularly in relation to classification, categorization and the standardization of information. A less cited, paper *Infrastructure and ethnographic practice* (Star, 2002) reasserts the importance of infrastructure as a domain of inquiry and particularly addresses the establishment of a new professional society. 'The Society of People

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[13] A version of the collection has now been migrated to the web and is located at http://mvz.berkeley.edu/. This 'site' contains with in a section of the history of the collection. It is a lovely example of the 'double historicity' of science that Latour advocates.

[14] James Griesemer also continued to teach publish on the history and philosophies of science, specifically the philosophy of biology (see http://www-philosophy.ucdavis.edu/people/history.html and

Interested in Boring Things' that privileged research interests in information technology using ethnography. (ibid, p.108).

The relationship of Actor Network Theory and Science Technology Studies is somewhat confusing. Here, it is simply enough to observe that they are, in effect, probably more inextricably connected than many scholars, who might use each paper peripherally, realise. For the scholar who bothers to observe the traces of bibliographic references, the cast of writers who have performed the evolution of both methods, it is quickly seen that many writers work in and out of each method and their languages. Latour appears frequently in the citations of Star and Bowker.[15] In turn, though Latour is often criticized for lack of referencing, Leigh Star and John Law are amongst those acknowledged in *Science in Action,* with Geoffrey Bowker acknowledged as having edited and 'suggested many useful changes' to that text (Latour, 1987).

It is the confluence of these literatures, and many others which were created alongside them, that gives weight to the ideas followed in this research. A glance at the list of past office holders for the Society for the Social Studies of Science [16] reveals a lineage of association through which STS/ANT was advanced. The interest of these writers has been to work some pragmatic, relativist sense into the separating dualities of Euro-American theorising which, despite the intense complexities it describes works the 'social' towards singular, neatly defined rationalist 'truths'[17]. To do this is to open the 'black boxes'[18] of neatly summed networks of bounded 'truths' and show that the 'social' and the 'scientific' are in fact networks of heterogeneous materials.

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http://griesemer.ucdavis.edu/).

[15] Of course many other mainstays of the STS/ANT stable are also cited but our interest in how the two papers explored are woven through.

[16] The home page of the Society for Social Studies of Science states it "is the oldest and largest scholarly association devoted to understanding science *and* technology. While as many of us study technology as science, we continue to use our original name, or simply 4S" http://www.4sonline.org/past_officers.htm.

[17] John Law provides a useful summary of these literatures and describes the importance of undoing the singular and adopting a pluralistic understanding which sustains multiple stories in *After Method* (2004)

[18] For a good explanation of black boxing as well as a useful comparison between ANT and STS see

Performed through shifts, mobilities and translations that constantly work between different 'sites' with such plurality and on such multiple scales, closure is never complete. Since the box is never finally shut STS/ANT is less interested in what is 'in' the box than what orders and assembles the borders and the boundaries between multiple 'boxes'.

What this view affords is a means to maintain the integrity of the 'mess' and the chaotic simultaneous action of material worlds. Working between the various competencies that temporarily stabilise and 'hold' people and things in configurations are the patterned 'realities', the dynamism of the knowledge, that is how both the worlds being explored and the knowledges about them can be understood.[19] Objects of interest might be better understood when disassembled, unfolded (or even 'exploded') into their component parts for the purpose of description.[20]

Following Order

Ironically, the trick of following the chaos of multiple action, so huge in scale as to seem impossible to summarise without recourse to the reductionist theories that are to be avoided turns out to be to follow its orders. People do this 'working back and forth' all the time as they work through their worlds. It is capturing it in text, as 'research' which proves such a challenge. Researchers need to look for what operations render the worlds of our interest 'commensurable'. Through the work of rules, files and sums, places without dimensions can be temporarily given dimensions (Latour & Herman, 2003, Plan 29).

Latour has exemplified this challenge, and something of a solution to it, in the 'virtual book' accessible from his web site, "*Invisible Paris*".(Latour & Herman, 2003) By following himself throughout the worlds with which he is associated in the course of a day, Latour, with Emile Herman, makes visible networks of connections between

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Kaghan and Bowker (2001).

[19] For a concise discussion of the risks of conflating the two perspectives see ((Latour, 2007a)

[20] See (Latour, 2007a)for a critique of an 'exploded' view of a VW Beetle in the exhibition *Cosmic Thing* by Damian Ortega.

people and things that make Paris 'work'. Of particular interest for this piece of investigation are Plans 5, 26 and 27, three of the multiplicity of descriptions provided in hyperlinked images, text and maps.

In Plan 5 we see Mrs Baysal in her office at the department of a university. As school secretary she 'dominates' the world of schedules, lessons and lectures. In the explanatory text accompanying the photographs of Mrs Baysal and her office, representing the social Latour maintains, 'always starts with large sheets of paper', necessarily involves turning 'inward' from the enormity of 'out there' to inscribe versions in ordered, commensurable form. The "token-like movements, transformation of signs into notice boards, notice boards into scribbles, scribbles into adjustments, adjustments into decisions" (ibid) capture the orders through which things get done. Importantly, this tracing back and forth is not to capture the global through describing local orders and fixing them to those things in some forever rarified order. Since multiple traces connect the global to local and back to global this rendering of things into commensurable orders simply allows us to follow some of their perfomances.

Alder expresses this as being how one might read things explicitly touted as containing entire worlds while still insisting on their particularity. (Alder,p.83).Law goes so far as to assert that he "refuse[s] to accept the analytical distinction between micro and macro". He maintains that 'network patterns' which, through 'heterogeneous engineering' of ontological performances punctuate the traces between global and local as 'routines' (Law, 1992, p.5). Law stresses the multiplicity and plurality of such performances, enactments which work between a "rich plethora of actors of all kinds" (p.133). A method which upholds the multiplicity of different enactments of reality necessarily sustains the concept that there is no simple or singular 'universal' but rather, "everything is relatively local [and enacted] in particular places" (ibid, 138). Summarising Latour and Woolgar's work Law agrees that 'reality is not independent of the apparatus that report it'(ibid, p.31).

Bowker and Star express much the same idea.

> "The material culture of bureaucracy and empire is not found in pomp and circumstance, nor even in the first instance at the point of a gun, but rather at the point of a list."

> (2000, p.137)

For Star, both relational and ecological, 'social' worlds become inseparable from the multiple lists and ontological orders which assemble the technical – hence they are considered to be 'socio-technical'. For Bowker and Star, leading writers of Science Technology Studies, infrastructures, the ordering, organising and balancing of the multiple 'intermediaries' that work and rework diversity into standardised stabilities is fore grounded.

Although Latour might contest the utility of notions of 'infrastructure' as tending towards immutability,[21] in '*Reassembling the Social*', Latour observes that the "dusty, overlooked, specialized, narrow little fields" whose concern was standardisation, who perform the task of "enforcing boundaries, categories and settlements", ought now to be "pay[ed] respect" (2005b, p.227).[22] Concluding a summary of much of his work to date. [23] Latour concludes that the gap between the micro and the macro has been shown, through repeated observation and description, to be simply another artefact. It is thus false to separate local and global.

As is his main point in *Give me a laboratory...*,all action and associations are the circulations and translations, the 'making of connection' at a distance, that gives things their dimensions. 'Sites', and networks of sites, actor networks, become simply stabilized and relational things, rendered visible only by foregrounding the conduits and mediators that work to associate them.

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[21] In an early work Latour observed with frustration "If you must have infrastructure…" (1988b) whilst 'infrastructure' does not appear in the index of reassembling the social.

[22] This perhaps is not giving sufficient credit to his colleagues Bowker and Star or the schools of information science with which they are associated.

[23] This work has reified 'actor network theory' into something resembling a textbook thus dangerously close to inviting treatment as the very kind of theory he advocates against! It remains nevertheless an extremely useful text if read carefully.

What lies between the micro and the macro, the local and the global, the agent and the structure, Latour claims, are standards, common understandings, that allow shifts in scale but holds things in place simultaneously.

> "the reason I prefer the notion of immutable mobiles is that it includes all the practices to maintain, through the invention of constants, the contradictory features of mobility and immutability of which those achieved by mathematics and geometry are only the most obvious ones, but there are many other: labelling, collecting, keeping up, listing, digitalizing etc (on this wide extension of knowledge pathways see for instance. Bowker, 2006)"
>
> (2007b)

To see these immutable mobiles in action we look for the 'sites' where this folding occurs, where, through progressive transformation, multiple 'real' worlds have been 'recontextualised' into reconfigured 'new' re-presentations.

This ordering appears everywhere, in offices, in timetables, museums, courses, schedules, menus. Collected and inscribed these things mediate between large complex worlds and render them commensurable, viewable and accessible for further active reconfiguration. The departmental secretary manages all the multiple worlds and hierarchies of academia, not by being in all places at once, but by 'bringing' them to her in neatly inscribed documents that re-present them.

Some of the best examples of this are found in museum collections. Worlds are collected disassembled, transported and reassembled in new relational orders to be 'gazed' upon through the media of 'exhibition'. As for Grinnell's tables of classification, assembled by trappers and scientists, exhibits of natural history re-present specimens "beak by beak, claw by claw [and] feather by feather". (Latour, 2007b, Plan 15).

During the eighteenth century such re-presentation of collections and their ordering practices was heralded by the 'opening' of the cabinets of curiosities which had hitherto been the domain of wealthy and leisured individuals. Collection became entertainment, science became exhibition. Curious contraptions emerged from all manner of private laboratories. These shifts were part of the territories in which Pasteur and Grinnell worked. Libraries moved into the streets and became infrastructures that lent knowledge; museums for all manner of curios became sites for collection, ordering and recording heritages. Display escaped from the artist's studio and private gallery and appeared in glass palaces and exhibitions, eventually ending up dominating the visual forms of the "public" street as shop window. Stuffed birds, brains in jars, pebbles and skeletons of early museums … all needed tagging and ordering. Located in grand and carefully fabricated buildings museums, libraries and archives occupied key roles in civic and educational domains.

The collections in these 'knowledge worlds', their specific geographic and temporal attachments broken and translated to the limited information on their associated labels, (Latour & Herman, 2003,Plan15) combine highly standardised, global practices with the particularities of local 'events' This meant that knowledge about them became more available and can circulate further, enabling the opportunities for new knowledges and new assemblages. Seen this way an 'event' (a book, a bird, a motorbike, a concert, a design) is not simply a bounded, completed thing. It becomes a trajectory of occurrences and association along which knowledges of it and about it can travel back and forth and each collection of things similarly, has its own pathway which manages diversity and stabilizes complexity (Latour, 2007b).

This brings the discussion back to the similarities between Pasteur and Grinnell. Though far more elaborate in Latour's descriptions the similarities to Star and Griesemer's definition of boundary objects seem perhaps more than might have been imagined. The creation of standard, replicable practices *in order* to render things commensurable can also elaborate how constant reconfiguration is necessary. The ideas seem to give rise to the hope of a workable method for exploring contemporary domains of knowledge-making and communication

Bringing the Laboratory Forward: ordering the web

For those who describe the social, who "think they know something about society worth telling to others" (Becker, 1986, p.22) what might contemporary information infrastructures have in common with the Grinnell's or Pasteur's collections and practices? Is the 'network of networks', the 'Web', simply another version? Collected data travels, compressed densely into physically minute digital forms and is thus rendered commensurable. Folding by a myriad of translations, transported across very different configurations of private and public space through information structures, 'data' reaches hugely distributed terrains.[24]

Certainly, this folding has amplified commonalities between previously distinct heritage and cultural institutions galleries, archives, museums and libraries[25] and from this, new opportunities for collaboration between digitized collections and their users are being explored. Central to these collaborations are the ways in which information infrastructures work exchange and delivery of digital collections. The changes in scale that are effected as knowledge travels from white board to screen interface and out of twentieth century 'labs', to be called up by a user's finger strokes into a digital display resemble the microbes from Pasteur's laboratory. Yet they require significant co-ordination in order to travel. That is the working of standards and classification – the 'sleeping beauty of library and information science' (Star, 1998)

Classification is at its simplest a vertical map. Like any map, those features that are visible are the ones that the user requires to navigate. The map that shows the roads but does not show the contours, is an inscription for a particular kind of journey

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[24] Museums, Libraries Archives and Museums sector have a global professional literature where these shifts are widely reported. his research drew specifically on trails followed from Digicult (http://www.digicult.info/pages/index.php), now no longer freely available; The Digital Library Federation (http://www.diglib.org) and, in New Zealand, attendance at New Zealand Library and Information Association (http://www.lianza.org.nz) conferences and the National Digital Forum (http://ndf.natlib.govt.nz/)

[25] For some "GLAMs" , as coined by Museums Libraries and Archives UK, though the term has caused some confusion with Glam rock. (Informal communication on nzlibs- listserv. May 2007)

(Becker, 1986). The map is thus a boundary object between the streets and the user who wants to walk or drive along them. Since not all detail can be inscribed careful selection is made, specific to the end user of the map.

The ordering of the Grinnell museum carefully inscribed the species of California for perpetuity and mapped them according to a hierarchy of classes. This is very close to the work of contemporary web designers who map knowledge terrains. Working in 'laboratories' of invention, web designs translate worlds into words on whiteboards, negotiated orders across disciplines and further translate into code and protocols. These travel along a multiplicity of associated and connected "bits", wires, plugs and circuits. The practices that effect these mobile knowledges bear acute resemblances to the boundary work of Grinnell's workers:- collection, translation, ordering, inscription and dissemination.

Galison has proposed a different way of seeing the co-ordination of differences of scale that operate in and out of 'laboratories'. He proposed that trading zones are effected between 'engineers, experimenters and theorists' (Galison, 1997, p.783) where groups can reach a consensus about the mechanisms for collaboration as some kind of neutral 'currency' despite differences of classification. For Galison collaboration is effected through the successful equalizing of interests within these agreed 'trading zones'. Different groups aim at certain shared goals. (, p.805-806) Although having distinct approaches they are able to co-ordinate around specific practices. Thus a laboratory for Galison is described as a localized zone where limited strategic co-ordination is achieved. Through the creation of 'interlanguages' hybrid practices that recognise the need to equalize exchange can hold long enough for scientific experimentation to be progressed.

Galison considers that a trading zone is never stable enough to endure for long and never achieved 'once and for all'. The concept shares significant resonance with that of Star and Griesemer's boundary objects in that it describes different interests co-coordinating around a common outcome. The key point of difference is that for Galison differences are agreed to be set aside and are *traded* for some common

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language. For Star and Griesemer a boundary object co-ordinates different interests in such a way that all groups can maintain their diversity and can collaborate without needing to surrender 'territory'. For Galison, new worlds, however fleetingly, are created and some may endure to enable further trading, or, in the case of the laboratory, a continuation of developing knowledge exchange and invention.

The concept of 'trading zone' resonates more with that of 'boundary infrastructure', developed by Bowker and Star from Star's work with Griesemer's. A boundary infrastructure is a network of boundary objects that has become sufficiently naturalised into a working infrastructure so that it can serve multiple communities of practice simultaneously. This "bringing into play [of] stable regimes"(Bowker & Star, 2000, p.313) in the localized worlds of its participants bears a similarity to Galison's 'interlanguages'. However, where they differ is that Bowker and Star are interested in infrastructures that, although never unitary, acquire sufficient stability to endure as classificatory systems. For Galison, as for Latour, stability s seldom achieved for long.

Not all social scientists consider the laboratory a useful site to investigate broader interests. Palladino, (2004) in a review of an investigation into the history of "biomedicine" cunningly entitled 'Give me a Laboratory, and I will raise the … Laboratory', has neatly questioned the risk of an " unreflexive privileging" of and "peculiar preoccupation" with the laboratory. The text under review, he claims, makes the error of being an asymmetric analysis where accommodations between institutions outside the "laboratory" work 'boundary objects' but this analytical concept is not applied within it. "[A] "structural" explanation and conventional notion of "agency" have no place in the laboratory, but, outside its confines, they would appear to hold sway." According to Pallandino, who makes reference to Griesemer, "brilliant example of the co-constitution of material practice and the discourse of information[26], such laboratory studies, that explain scientific and technological change from a materialist, as opposed to idealist point of view, have rendered the laboratory an analytical obligatory passage point where it ought to be considered "far from a

necessary and sufficient agent of change". Calling for more reference to Latour (amongst others) he cautions that more careful observation of the "synergic transformations" of worlds would discover mutual dependence of "actor" and "network" which simultaneously worked change. Thus he recognises the utility of the laboratory as a tool for description but cautions against any ubiquitous use of it.

More recently still, Vinck (2007) has called for a return to the interest in the laboratory as a "system where objects, instruments and skills are re-opened". After a brief and useful summary of laboratory studies, beginning with Latour and Woolgar's seminal text, Vinck asserts that by integrating a stronger focus on organizational practices with the methods of science studies there is potential for the creation of new knowledge production spaces. There, resources can be assessed and reconfigured "in order to integrate [them] into new registers and knowledge projects" (ibid, p.10).

Each subtly different concept for describing the locality of laboratories naturally reflects the differences of the terrains of its description. Where these different interpretations agree is that invention is brokered through local experimentation that is then rendered global through some process of translation. The following chapter will review some of the themes in literatures around contemporary ICT 'laboratories' which have utilised some of the above concepts with specific reference to new knowledge spaces.

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[26] The review does not adequately reference this reference.

2. "New" Information Laboratories

" … The disorder that is wiped away on one side by describing the tasks meticulously in neat logical trees turns up again on the other side, among the programmers, who are having as much fun as a barrel of monkeys, shooting themselves in the foot, dividing up tasks according to procedures that can't be described, for their part, in neat logical trees"

(Latour, 1996, p.223)

The ICT design "project" has become a significant actor in the creation and distribution of 'new media' technologies. As a significant form of collaborative space, the project can be observed through much the same lens as Latour utilised to open the apparently linear and straightforward work of scientific laboratories (Latour, 1987, , 1988b; Latour & Woolgar, 1979) or that of Callon and others interested in the 'techno-economic networks' (Callon, 1991) and 'turbulent environments' (Vinck, 2003) of engineers. Indeed, much ICT innovation is located in multidisciplinary 'labs'(eg: Hitlab, MIT media labs), hybrid sites that produce the hybrid information infrastructures which enable 'new' technology and 'knowledge' worlds to circulate[27].

Detailing the richness of these collaborative efforts that have hauled something together successfully (or perhaps have tried and failed), makes for equally rich description. What makes following these 'behind the scenes' efforts (Star, 2002) a "worthy task" (Latour, 1996) is, that by understanding the complex, simultaneous and perpetually uncertain characteristics of collaborative design work, it may be possible

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[27] Terms that describe digitally enabled information flows proliferate in many literatures. 'e' has become a nearly ubiquitous prefix for any activity utilising 'electronic' computer networks , 'digital' is substituted sometimes used more correctly to describe formats that store data digitally. 'Information' and 'knowledge' are used in hugely varied senses. 'New media' caches all these and includes platforms and delivery formats as well. In this text 'information' refers to the data that circulates as content whereas 'knowledge' describes the weightier concept of information which has been embedded into more complex networks. Some exploration of the extent to which differentiation maps to that of

to understand more about the ongoing circulations of information infrastructures. Extending the discussion of the first chapter, this chapter summarises literatures that have utilised one or other, or in some cases both, the work of Star and Griesemer, on boundary objects and information infrastructures, and Latour's rendering of innovation sites as laboratories.

Of interest for this thesis is how the concepts for understanding innovation in the 'laboratory' and via boundary objects which were detailed in the first section, enable an understanding of these intersecting socio-technical performances. The innovation design phase of ICT projects seems to enable a good starting place (Girard & Stark, 2003; Henderson, 1991; Mackenzie, 2005; Ribes, Baker, Florence, & Bowker; Wakeford, 2003).

Bundled into such socio-technical observations are a number of significant strands of interest for researchers who follow ICT design. This section separates the domains artificially in order to make visible the competencies that comingle if considered at a distance. The first is an interest in the project as an organizational hybrid which 'sites' ICT work. The second is a concern for identifying the boundaries, if any, between human design and technical developments of ICTs. The translations that create a piece of software, code or web navigation involve significant 'flexing and pulling' (Pollock, 2005) between actors. Human professional actors mingle with hardware, text, telecommunications and organisational infrastructures in perpetually reconfigured performances of design.

The third interest is around boundaries between designers and users. Previously considered by many a straight forward dichotomy where ICT 'products' were launched into domains of consumer use, this division is now apparent as overly simplistic, particularly as new, "do it yourself technology" (Fleischmann, 2006) disrupts professional boundaries of infrastructural work. The fourth is of less usual interest for sociology but one which intersects significantly with the other two, that of

the difference between intermediaries and mediators is worthy of further observation.

the interoperability of information infrastructures. Interoperability is the quality whereby all the processes of information flows invisibly support the use of them without need of reinvention. These require more standardised, formal and less flexible arrangements to effect the coupling of information systems in order to deliver across a range of 'sites' and platforms.[28] Of final interest for this chapter is how co-evolving socio-technical representations afford new opportunities for 'public' interaction.

Laboratories and Projects

As for innovation in scientific laboratories, the practice of configuring new alignments of social and material things that are simultaneously localised yet are in the process of being rendered capable of travelling beyond the laboratory, 'the project' works to engage new interests in order to stabilise further alignments. Through what Suchman (2001, p.168) has termed narratives of "persuasive storytelling" designers manage the chains of partial translations that bring an idea through the stages of approval, design and construction in order to realise the projects "dream" .ICT designers are always actively engaged in the production of substantive possibilities (Taylor, 2004, p. 27) where things are only "known vaguely" (Law, 2003, p.4) in what is a process of ceaseless constitution of diverse and unstable technologies (Farnsworth & Austrin, 2006, p.1). At any point, something can be made more or less 'real'(Miller, 1997, p.82).

To grasp this notion of multiple 'real' which circulates with a high degree of flexibility and uncertainty, description must shift from considering technological innovation as a single event and consider the multiple ongoing practices of design (Suchman, Trigg, & Blomberg, 2002) and where they lead. More than simply reporting outcomes, good description follows how the artefacts of innovation are externalised and distributed. This form, 'the project', undoes the simplistic dichotomy of 'inside and outside'. Artefacts travel seamlessly between innovation and

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[28] Languages for ICT worlds often resonate with other languages. In this instance 'Site" could equally well be read as a 'website' or a location of innovation. This linguistic plurality, far from throwing up

articulation leaving many loose ends and incomplete translations. What holds and what does not, what becomes embedded in the form of what is externalized. Thus innovation is the sum of what Latour has described as "countless detours and circulations, crises, disputes, inventions, compromises, substitutions translations and orderings that get more and more complicated and engage more and more elements" (1988a, p.273).

Strathern has also observed that a project engages a range of different interests that, unlike other forms of production, remain attached to the project's assembled knowledges. This is a particularly apt observation for projects that seek to produce prototypes. Such realised yet not yet real things have been rendered just sufficiently stable enough to be established as 'facts' so that they can travel and go beyond the 'laboratories' in which they are built. They then gain the 'possession of strongholds" (Latour, 1987,p.104), along which will pass from one to another, the future fate of the idea in the ICT sector. Through resources, such as funding, makeshift and hobbled together hardware and software arrangements, business plans and sponsorship proposals, such prototypes perform provisionally to mediate between the laboratory and the domains beyond it. The scale and weights of these hybrid assemblages change as attachments, human and non-human, are configured to work the realisation of 'real'.

Crafting "Tech-knowledgies"[29]

Quite how information infrastructures come into being is often disregarded or considered irrelevant in observations of ICT work, perhaps because the infrastructural nature of the work does not always readily intersect with larger concerns around race, gender or power (Bowker & Star, 2000; Star, 2002,p.110). Mackenzie (2005)argues that the performity of information flows acts in such a way that the underlying detail of the work is covered over. However, as ICT technologies are becoming ubiquitously embedded in everyday practice there is increasing interest in describing the work of

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ambiguities, characterises the strength of STS which can observe such folding of worlds into words.
[29] This term was used in a conference report about contemporary museum practice (Adami, 2005).

creating these 'infrastructures of communication'(Star, 2002) that previously have failed to attract much attention from social scientists. Vinck et al (p.6) have commented that little is actually understood about design practice, despite much being written about innovation and change. This in between work which combines multiple types of knowledge and information system vocabularies in ambiguous and non linear assemblages has 'no fixed boundaries, protocols or procedures [and] indeed it is defined by the lack of them'(Baker & Bowker, 2004).

Understanding the materiality of information work requires unpicking the smooth 'front ends' of ICT and exploring the 'boring, backstage parts ...[and] back stage decisions (Star, 2002). According to Star (1999) in the case of information infrastructures such practices are articulated as "delicate complex weaving together of desktop resources, organizational routines and running memory of complicated task queues" (p.6), a list explicitly inclusive of human and non humans. Such work occurs across multiple registers where perpetual reconfiguration, redesign, recombination and diverse options characterise the "crowded field" of new media design (Girard & Stark, 2003). Often this work is presented as linear and hierarchical but ethnographic studies quickly reveal far more simultaneous and chaotic realities. (Baker & Bowker, 2004; Bowker & Star, 2000; Girard & Stark, 2003; Henderson, 1991; Latour, 1996; Miller, 1997; Ribes, 2005; Ribes, Baker, Florence, & Bowker).

Daily experience of this ICT design work is to grapple with the irony of highly structured information interfaces and systems of classification that circulate through electronic and digital networks. Since such enactments come in the plural, the crucial question to ask about them are how these "tech-knowledgies"(Adami, 2005) are coordinated (Mol, 2002,p.101vii) and how dothey, in turn, co-ordinate.

The simultaneous nature of ICT design work does not seem to follow linear, hierarchical or temporal patterns associated with 'industrial' production. Vann and Bowker (2001)have observed, through following a range of engineering projects, that real knowledge does not follow formal, pre given standards of action because a 'renegade real' acts to undo the hierarchies of normative practice (p.4). For Eischen

(2003), who has followed software development, it is the links with the social resources such as these that inherently limit the ratonalisation of industrialised practice.

Adrian McKenzie (2006), stresses the constantly divergent realisations and slippages that characterise software development by following the take up of software networks. He observes that the "relations, politics, and ontologies associated with new media are not radically different or dis-embedded [from] old media" (p. 443) But MacKenzie (2003) elsewhere argues that understanding contemporary softwares and electronic communication is difficult because "locality becomes slippery when things and practices in a given location constantly refer to elsewhere or are indeed constituted specifically to resist localisation"(p.366).To introduce his argument Mackenzie draws on both strands of literature introduced in Chapter One utilising Bowker and Star's definition of information infrastructures and Latour's described method from *Aramis*. In a description of a specific software development, he identifies a 'topological problem' in which an attempt was made by and IT company to map telephones to computers. Mackenzie outlines the challenges such a combinative method poses by assuming too much that locality is literally grounded. He questions whether a new conception of locality needs to be imagined to describe communications infrastructures.

Mackenzie observes the 'collaborative craftwork' which produces a "drift of fragments"(ibid p.377) from the many different requirements of ICT design and implementation. Important for this paper is that Mackenzie elaborates Latour's assertion that technology is best followed through the processes of contextualization and de-contextualization. He describes, amongst other outcomes the "proliferation of formalisms that produced large 'documentation trees' (ibid,p. 376), which he argues are most effectively understood as having been materialized from the collective imagining that occurs in 'between' individuals and infrastructures. He asserts that in worlds of software development these two processes might not necessarily always be occurring simultaneously. Such imagining of complexity and detours works across boundaries of standardised protocols to produce "kinks and folds in software

architectures" (p.380) that are not easily describable. Mackenzie conceptualizes this as potentially dislocated imagined work that is not as necessarily locatable along any identifiable chain of translation or meeting of infrastructures as either Latour or Bowker and Star might argue.

This 'imagining' of the opportunities for dispersed and dislocated reconfiguration of information worlds has been observed by other writers who have described the pathways of ontological knowledge. The shift from the centrality of 'the collection' towards perceived 'unruly information behaviors' of Web scientists and information managers is the subject of a paper entitled "*Dewey meets Turing'*(Paepcke, Garcia-Molina, & Wesley, 2005). It claims that the web not only blurred distinctions between consumers and producers of information but that items which had previously been closely aggregated as 'collection' were now afforded the competencies to disperse "across the world and [be] under diverse ownership" (ibid, p.2).

Paepcke et al argue that while this did not undermine the practices of computer scientists, whose work had always sustained divergent, public, uses of their softwares, newly dispersed, and potentially reconstitutable, information 'scapes' represent significant challenges to the practices of librarians. They argue that the web's "hyperabundance of duplication and content alternatives" destabilizes the common ground of "repeatable, predictable" knowledge practices of traditional information production They conclude however that the very same destabilized territories offer new opportunities for each discipline to collaborate around flexible styles of online presence. They conclude:

> "If only librarians would stop making computer scientists choose content descriptors from a controlled vocabulary of terms…Oh well, in any union both sides need something that recalls their old identity. In return, Web servers of flighty computer scientists get to return their irresponsible "404 Not Found" which makes any librarian worth their salt grit their teeth" (Paepcke, Garcia-Molina, & Wesley, 2005)

Another observer, Zhang (2007), has detailed the challenges presented to this world of

ontology building to meet the 'use expectations nurtured by modern technology' and the Semantic web. She refers to the difficulties of associating adequately defined 'upper level ontologies' through adequate aggregations of general knowledge bases in components that computers can process. She stresses that the key component for actionable information is, not so much the more common 'data centric' investigations of Web sciences but rather that equal weight is given to the processability of distributed information systems by both machines and humans.

The remainder of this chapter summarises other literatures that detail such collaboration between humans and machines in terms that draw from the worlds in which they operate.

Trading Zones

Mackenzie's description of the software developers at Forge includes a quote about some of the softwares as "traders" (2003, p.381) These are the "distributed processes which help the environment to work" (ibid). Mackenzie argues that the importation of market conventions assists in the reconfiguration of the system as an environment of "highly interlocked texture of different metaphors". Mackenzie's description might have looked towards Galison's work for an analytical concept which mapped to the participants own expressions.

Chrisman (1999) drawing on Galison's analytical concept of the trading zone asserts that if knowledge is to be cumulative it must be shared and it must be sharable. Among other elements the sharing process requires a "geography and a temporal coherence"(p.3). It is the ordering of these elements that translate into 'doing' standardisation. Unlike boundary objects that can hold "agreements to disagree" (Star, 2002) and which manage partial translations, standardisation can afford little margin of error or conflict in order to operate.

As described in Chapter One, a trading zone, more architectural in its agreed form than a boundary object, operates as the creation of a common language which

successfully stabilises sharing. For programmers this worked commonality is crucial to facilitate the circulation of code that produces standard and ubiquitous operational languages. Ontologies operate "formal, explicit specification[s] of shared conceptualisation" (Garcia & Gallinas, 2007, p.143) and provide a framework for understanding while languages, such as XML, XHTML and Java, become agreed standards that circulate.

The active working of this kind of agreement can also be seen where references to technical mediators circulate in management literature as follows:

> Where organizations have to manage a lot of data from heterogeneous sources like conventional database systems or the new Web data sources, it could be necessary to use tools as mediators to integrate these data to a common format to manage both types of data together…the aim is to store all the necessary data in the same format: XML" (Garcia & Gallinas, 2007, p.282)

Informally technologies are worked as user/designers are enrolled by them and more formally, through socio-technical, institutionalised arrangements such as W3C (World Wide Consortium http://www.w3.org/). Other trading zones might be said to operate around plugs, wires, circuits, switches and many other of the "boring things" (Star, 2002) that literally connect ICTs, their human and non human 'users'.

Users

> "…representations exist only fully when someone is using them"
>
> (Becker, 1986, p.129)

Until recently the key text around which discussion of computer use and usability (being the ease and efficiency of use) was Steve Woolgar's description (1990). Woolgar accounted for the ways in which usability studies embedded in the design process set parameters of use for a computer's design. In this manner, the design process was considered to 'configure' the user. Woolgar's piece was important, as it

opened up a debate as to where the boundary between the producer and user might be located.

Since then, as the innovations of 'new media' circulate and disrupt to the traditional producer divide, 'much ink has been spilled' around this issue (Suchman, Trigg, & Blomberg, 2002, p.165). The mobile competencies that characterise sites of design have been observed increasingly in sites of use. Producer's management of these boundaries has been shown to be more complex than Woolgar suggested. Observers now describe how technologies and users mutually shape each other so that innovation now occurs from the work of hybrid designer /users who mobilise a range of competencies across highly fluid boundaries. (Austrin & Farnsworth, 2005; Bishop, Neumann, Star, Merkel, & etal, 2000; Boczkowski, 1999; Fleischmann, 2006; Mackay & etal, 2000).

This convergence, described as 'user meets infrastructure' (Bishop, Neumann, Star, Merkel, & etal, 2000), works in much the same simultaneous process of negotiated compromise described by observers of design laboratories. For Bach and Stark (2004) the recombinatory logic of interactive technology"(p.103) has shifted mass produced, uni-lineal communication into networks of productive communication. Unlike designers sited in laboratories who negotiate their design conflicts through visual intermediaries such as whiteboards and sketches in an effort to stabilise a prototype or plan, the networks of user/designers co-construct new infrastructures in a "sea of enabling technologies" (Austrin & Farnsworth, 2005, p.3) in anything but lineal time.

Designers

While these co-constructive worlds are certainly becoming more ubiquitous, it would not be accurate to assert that the work of design as an asserted activity has necessarily been diminished by them. For this study, the role of the Designer, as a specifically enrolled discipline, has particular relevance.

The experience of design work is intense and varied. Some 'thing' is being created

that has not existed before. An idea is 'worked up' into being through the effort of appropriating and associating the elements required for actualising it.[30] The range of skill enrolled to effect such an outcome will more than likely be multidisciplinary and technologically varied, involving humans and non humans. In the domains of ICT 'techno-scientists' often produce visually oriented artefacts (Henderson, 1991).

Of particular interest for observers of design work has been the identification of non-textural artefacts that are assembled to mediate between multiple disciplines in order to get the job done. Henderson (1991) while following the translations of design concepts into CAD/CAM engineering drawings has observed that the translations of the tacit knowledge amongst design teams tend to be mediated through visual artefacts, sketches, drawings and notes. These inscriptions circulate much like those of Latour and Woolgar's laboratory (1979).

Wakeford (2003) observed, through following the establishment of a multidisciplinary research unit, that the translations of ideas into sketches, drawings, pin boards and, importantly, the bodily gestures that connect them, perform an active mapping of connection and embodied ways of translating data. Wakeford extends Star's (2002) concept of 'intersectional work' through boundary objects into the notion that such visual artefacts act as professional 'hyperlinks' between various skilled interests and create "ways of talking" that go beyond conventional textual ways of working (p.234). For Wakeford the visual re-ordering of categories of ideas allows the enactment of performative stories by a project's human participants. Importantly, since all translations are inevitably only partial, this leaves some communication complete and some undone. Thus like Becker's non textual, partial pictures of differentiated worlds as maps (1986 pp.122-124; Ribes, Baker, Florence, & Bowker, nd) such artefacts simultaneously co-ordinate interests while at the same time contribute to the uncertainty of the project's outcomes.

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[30] 'Thing' in this sense should be read with its heaviest meaning, whereby multiple and heterogeneous associations have been folded into some, for now, stabilised form.

Alder, who utilises the conceptual methods of STS/ANT to view the work of engineers in the ancient regime summarises this work as follows:

> "a sketch or 'free-hand' drawing emphasizes the open-endedness of the design of an artefact – and one of the ambiguous roles of the conceiver and its maker. The rules of drawing here are ill-defined, even idiosyncratic. This is a quasi-private language, used as an extension of the creative process, or as a kind of private notation to oneself or ones immediate colleagues" (Alder, 1998, p.20) [31]

Thus like Becker's maps and Grinnell's classifications, non textural, partial pictures of differentiated worlds as maps (1986,pp.122-124) simultaneously co-ordinate interests and contribute to the uncertainty of the project's outcomes. This localised mapping (Becker, 1986,p.124) and selective sorting of the elements in order to impose temporary limits on a project is crucial in getting the job done. Divergent interests are translated into invented hybrids that may take momentary but significant places along the chain of innovation. For Vinck et al (2003) appropriation of such hybrid communication strategies can represent critical moments for the process and become socio-cognitive artefacts and comprehension mechanisms in the design process (p. 187).

As for Latour's immutable mobiles this coordinating of worlds can be achieved only when different interests are translated into mutable, combinable inscriptions that render them commensurable. Drawings, sketches, whiteboards, spreadsheets – all perform as intermediaries, "collections displayed on tables" (Latour, 1999a, p.38) during the process of building common meanings.[32] When words and drawings are substituted for things, traits that define them are conserved, while at the same time,

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[31] Some writers would claim that it is not relevant to utilise observations from history to illuminate contemporary work. The intersectional work of Historians and Sociologists is an area worthy of further study. The work of Bruno Latour and Ferdinand Braudel, who approach materiality with some possible commonalities, would be a good starting place.

[32] A number of projects under development are interested in meeting this need for collecting people and things together across widely located spaces. In New Zealand Such hybrid user interfaces include : Hitlab Virtual Project for BRCCS , http://www.hitlabnz.org/route.p=hp?r=prj-view&prj_id=39 and the Mobile Collaboration Project, http://www.hitlabnz.org/route.php?r=prj-view&prj_id=17

they are rendered mobile and thus available for combination and configuration into new things (p.63).

These non-textural tools allow different members of the group to read different meanings particular to their needs from the same material, affording the tacit knowledges to remain flexible yet stabilised. We have seen how they perform as boundary objects. But, does the concept enable a good enough description of the fraught and messy processes that observations discover?

Girard and Stark's (2003) description of a New York web design company describes the uneven and simultaneous nature of the workflow. The work exemplifies the 'simultaneous engineering', a term used by Sabel and Dorf (1998) and cited by Girard and Stark (p.88) whereby sub-systems of the design process run concurrently, conflating any linear organisation into multiple sometimes competing hubs that are distributed across the workroom. The work almost always involved engineering something that had never been built before, blending multiple knowledges specifically assembled for each project and then broken again as new deadlines asserted themselves over existing ones. Girard and Stark observed constant motion as a characteristic of the work flow for the collaborative engineering they describe. For them, the constant configuring and re configuring of connections between workers, technologies, groups and projects was articulated with reference to Boltanski and Thevanot's (1999) concept of a sociology of critical capacity For Boltanski and Thevenot different disciplines attributed different orders of worth to aspects of the work: efficiency and logic for the programmers; visual, stimulating, interactive for the designers; cognition for the information architects etc. This diversity lead to significant disputes whose outcomes are unpredictable precisely because the orders of worth in contest were so fluid. Where such multiple regimes of worth are kept at play so that maximum benefit can be gleaned from unpredictable design outcomes and opportunities. Where such a range of skill and work practice is jumbled together (in this case in open plan, shared work space) rigid authority cannot facilitate fast enough action for effective outcomes. They describe the casualness of the work environment cum construction site blended with intense work habits that resembled pre-industrial

rhythms where bouts of work were followed by relative idleness. (p.91). For Girard and Stark the organisation of this 'collaborative engineering' becomes "heterarchical", neither market driven nor hierarchical bureaucratic but effected through interdependence and simultaneous negotiation around unpredictable and 'rugged' expectations, driven by entrepreneurial design goals. Michael Wolff, an early web entrepreneur, has described this as "dorm living, the junk food and dirty T shirt, but then you also have the tendency to take oneself very seriously…[with] meetings …that have a kind of political youth camp quality"(1999, p.226).

It is not difficult to weave the descriptions referred to above into understandings of their sites of work as new media laboratories. This concept works to make visible the uncertain nature of the outcomes of effort. A combinative methodology that floats the working of boundary objects around orders of worth and critical capacities whilst sited in laboratories of invention begins to have utility for a description of design work.

Standardised Code

In worlds of 'do it yourself' (Fleischmann, 2006) information the notion of effective information delivery has been transformed into a discipline of effective enablement. What has allowed this has been the configuring of multiple technical practices that perform highly sophisticated aggregations which, rather than simply delivering operations along set lines, now have the ability to 'plait and fold' data (Bowker, 2003) Multiple and heterogeneous code, data languages, tags, ontologies and other data hierarchies work the communication infrastructures and 'networks' of worlds in, to paraphrase Star, 'behind the screens'. This embedding of techno-social practise is rendering the 'www' and its associated applications as a large and variably mediated map. In between the use of a lap top to access email in a private lounge and globally distributed information networks is a vast infrastructure of interoperable metadata. (Pollock, 2005) Literally data about data, metadata mobilises the competencies of multiple and heterogeneous ICT domains and enabled properties to be constantly and

seamlessly swapped between humans and non humans.

The intriguing paradox of metadata is that the opportunities for action it enables (that is executable code and information interfaces which enable data to circulate freed from localised sites of operation) are underscored with necessarily highly standardised languages. At one level, the public or user level, classification exists only in as much as users create 'clouds' of meaning as massively interconnected collections of significant user-generated labels on web sites. [33] At another level though, this open and freely located work requires intensely dense structures of authority, protocol and standards which are constructed through negotiated agreement between assemblages of intermediaries and mediators.

To be able to perform at all, digital networks have myriads of standardised protocols which cannot be broken, sequences which must be complied with. To move and circulate , the 'flat' and user centered democracy of such infrastructures as 'web 2.0' has required as much, if not more sophisticated ordering than the first layers of code which connected the first machines on the 'Arpanet'. The orders of worth operating for these standardised infrastructures are distributed more towards the technical than the social since for these networks to hold it is the logic of code that must be connected. Worked by myriads of wires, plugs and switches as well as humans, it is useful to observe how technical objects enable almost complete translations as data flows.

The traditional work of knowledge management is being reconfigured by this trend so that, as Geoffrey Bowker (2005) as phrased it "…traces have multiplied and the rigid classifications are withering". However, new classification forms must inevitably replace them. Bowker makes the point that standardization and classification are essential to the development of working infrastructures. Strings of bits traveling along

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[33] Such clouds measure the incidence of words, user designated "tags" and deliver them graphically as moments of dominant interest. These clouds are actively linked to content within the site.   Thus, as one reader of a blog on the other side of the world pops up on the map of a blog writer in New Zealand, the cloud shifts ever so slightly, the users worlds have interacted and performed information building.

wires are meaningless unless there is a shared set of 'handshakes' among the various media they pass through (p.110-111). Working up and down there is no "simple break point" where communication protocols stop and technical standards take over. This constant process of alignment that is the " hustling" (p.113) of work practices of the people and things involved in economic, political and technical networks, further undoes somewhat the notion of single obligatory passage points in the building of information infrastructures.

Interoperability: performing socio-technical 'publics'

Fleischmann (2006) argues that for the purpose of studying the design and use of software the "radical symmetry" of actor network theory can benefit from being put in conversation with social worlds and boundary objects. Networks of social action and the intersections of them require explanation of "deeper meaning regarding culture and social structure". While acknowledging the mutually constitutive relationship of technology and society and still disputing determinism, by reasserting the importance social agency Fleischmann moves the 'absolute middle' of ANT's symmetrical analytical to what he perceives as the divide between the physical and the social.

Such a view is a long way from Latour's when he asks:

> "what can we do to give technology the dignity equal to that of morality so that we may establish them as relation which would no longer be that of tool to the intention?" (Latour, 2002, p.2)

Law and Singelton answer this in part by claiming that

> "…technologies, knowledges and working may be understood as the effects of materially socially and conceptually hybrid performances. Specific assemblages [perform] with specific consequences, always in context of other performances and thus uncertain. New performances interact with old performances… What appears as one thing must be understood as a set of related performances. The general is made general locally." (Law & Singelton, 2000, p.6)

This working of general to local resonates strongly with discussions of how 'publics' are effected through and by 'new media technologies'. Globalised connectivity is

often articulated as the transformative development which has brought revolutionary change. Inexpensive and nearly pervasive access to networked digital devices now allow ideas, messages and content to transverse the globe in a matter of seconds. The way we learn, play, work, buy and communicate has been forever changed. Already we've seen some early innovators make a profound impact on the way content is created and consumed.(IBM, 2007)

Statements such as these negate the complex, messy and at times chaotic work that actually makes such "seamless" delivery reality (all be it a momentary one). The internet has proven a good resource for community organising and its spread to enable nearly ubiquitous computing has been accompanied by an exponential growth in the number and visibility of non-governmental organisations(NGOs) (Bach & Stark, 2004, p.101). However, it ought not to be assumed that this 'explosion' has been straightforward or inevitable.

Bach and Stark (2004) assert that the "growing power" of NGOs is not simply reducible as an organisational form. Rather it is the co-evolution of NGOs and new media technologies that act together in the shift of participatory politics. This combinative performance increasingly enables the enduring associations which provide "occasion[s] for innovation that restructures interdependencies, reshapes interfaces and transforms relations" (p.101) New forms of connectedness have managed conflict and competition and resulted in "weird and wired coalitions" (p.107)that renegotiate communities. What Callon and Rabeharisoa (2003) term the "logic of representation" via ICTs has become a new site of struggle for social networks, shaping new platforms of participation(Austrin & Farnsworth; Bruszt, Vedres, & Stark, 2005). Bach and Stark (2004) observe that amongst enduring NGOs knowledge communities have evolved out of models which previously worked as information brokers.They illuminate the importance of the process of "link, search and interact" which works "patterns of links into patterns of interaction" (p.113). Such "recombinative logic" enable negotiation that re-orders global temporal-spatial orders into globally distributed knowledge spaces.

This re-ordering is the stuff of the digital dreams that seek to reconfigure participatory publics. Crucially such assemblages of knowledge spaces are inseparable from the infrastructures that work them. Star and Bowker (2000) assert that "a good infrastructure is one that is stable enough to allow information to persist [yet] modifiable enough to respond to emergent social needs"(p.313). Working the flexibility that can assemble such relational technologies, where a range of possible tasks, properties, hardwares, softwares and people engage are both the technology, the technologist and the organisation (p.153) in variably socio-technical hybrid collaborations. What has been observed in some domains is that, rather than realising the potentials for a 'global civil society', civic participation is co-evolving diverse and specific publics that are primarily domestic (Bruszt, Vedres, & Stark, 2005). This reworking what of what Bowker and Star observed as "battered notion of community" breaks the separate elaborations of knowledge that have previously existed between specialist and 'lay' communities. From new logics of representation new tools for visualisation, new collaborations are being worked.

Andrew Barry's rendering of new diagrammatic objects which further reformulate the museum exhibition argues that interactivity is affording new opportunities for active citizenship. In Barry's ideas we can trace confluence of our two nineteenth century scientists. Barry asserts that the interactive diagram "incites the visitor to interact with objects in the way a scientist researcher organises his experiments. Experimentation does not apply only to the object with which he interacts. It extends to the visitor himself…he is learning to behave as a technological citizen" (Callon, 2004, p.123).

However, behind the interactive objects with which Barry's visitor creates new civic territories, digital collections exist as extensive networks of classification and coordination. Whether choosing Mackenzie's notion of imagined dislocated functionalities between use and production or adopting Bowker and Star's description of 'ecologies' of relationships amongst disciplines (2000, p.70) it is difficult to refute that the methods of assemblage/method assemblages that allow a digital interface to deliver content are inextricable associated with the work of classification, ordering and placement.

Ordering Hierarchies

Although descriptions of organisational 'heterarchies' (Girard & Stark, 2003) of simultaneous effort (Vinck, 2003,Star, 1999 #23,Suchman, 2002 #131) have shown the extent to which hierarchies of work are undone or 'messed up in web and other digital media design worlds, it is indisputable that the linkages that connect them are less likely to take such form.

Carter and Michael (2003) have described how educational texts perform as both immutable mobiles and as boundary objects depending on whether it is the work of alignment and the potential combinatory nature of the text which is described or the longer term strategic goals of the materials produced. Thus, it is proposed that such a combination of analytical concepts may be valid for a description of web navigational structures.

These highly dynamic lists of the 'new media' orders are hybrid representations of long chains of association that render content deliverable. Represented as 'addresses' 'links'or URLs, when they work, these associatiors literally 'navigate' back along chains of translation to locate 'data'. As such, these elements in the burgeoning terrains of 'the web' operate as both immutable mobiles and as boundary objects. As stable things that allow data to flow they align multiple and various actors via their properties of being both fixed and mobile. Yet they also coordinate different worlds via naturalized and routinised standards and these conform to the definition of boundary infrastructures. Further, as digital collaborations are worked globally, these strings of assembled locators increasingly connect a plethora of software interlanguages. Much of the internet might then be considered a vast trading zone.

The interest of this thesis though, having gone out and collected some 'meta' ideas with which to describe, is to turn inwards to one specific locality, a site of invention, and to unfold through a series of vignettes the design of just one 'descriptive tree' that could co-ordinate knowledges in that digital space.

3. Towards a Method Toolbox

From this summary of literatures that work some of the analytical concepts from ANT and STS in various ways, is it possible to pack a 'methodological toolbox' to take into domains of ICT? It would seem as though combining descriptions of the worlds as 'laboratory' with descriptions of collaboration by utilising the concepts of boundary objects and boundary infrastructure may effect useful illumination. However, utilising any analytic concept for the purpose of summary runs a risk of falling into the very deterministic research pitfalls that Latour and others caution against. Latour's invented characters, who direct their students to 'simply' follow,(1996; , 2005b) make an excellent argument for methods that brings no a priori assumptions about any domains of interest. It is also clear that a pragmatic method that can open what Law and Singelton (2000, p.5) have identified as the "indefinitely multiple versions of materially heterogeneous effort[s]". Once alerted to the inappropriateness of imposing 'theoretical' orders onto worlds where no evidence of them has necessarily been observed, any 'framing' of research rests uncomfortably. Latour's imperative to give attention to the circulations and movements that get things done, to tell a world as the actors would and not to describe beyond this, renders a method which, indeed, leaves less 'misfits' than traditional, rigid theoretical exercises might.

However, for such description to do 'justice' it is necessarily lengthy. It is fine to say "start where you can and stop when you have to"(Latour, 2005a). Performing this as a researcher in messy worlds is easier said than done! Describing how 'tiny differences' (Law, 2004) can quickly become big changes can take a lot of words. The language of ANT, the 'tools' developed by Callon, Law and Latour, have circulated along multiple chains of academic inquiry. Short papers, for example those of Suchman (2002), Henderson (1991) and Eischen (2003), could not accommodate the length of description of longer texts, for example, *Aramis*, *Laboratory Life* or even the observations detailed in Vinck et al(2003).

Analytical concepts, although running the risk of slipping into rarified theory, can if

used carefully, offer a method towards useful abbreviation. What is to be avoided is the use of concepts to articulate, merely, the utility of concepts. Perhaps this caution could be a note, pasted inside the 'lid' of the method tool box assembled by this text?

Following is a list. Like any list it is not complete but its categories, as for any good collection, have been retrospectively certified along the dual knowledge pathways of the work of this thesis. Emerging as it does from the writer's assemblage of understandings, necessarily partial and continually evolving, it is not referenced as for academic genres. Its references circulate elsewhere in this text.

The toolbox simultaneously concludes this section of the thesis which has described literatures and precedes the next section which describes a world of innovation. Acting as something of a (misplaced) glossary, the list borrows from Latour's concept of a method tool kit with which those who are interested in things socio-technical might attempt to "pack the world into words"((Latour, 1996, p.24)*

*Disclaimer: The list's order is alphabetical. All tools provide a guide only. Use is at the researchers' own risk.

Figure 1: 'Toolbox'

Method 'Tool Box'

Boundary object: useful for describing multi-disciplinary work (people or things or people and things) where worlds converge but do not stabilise new worlds (Star & Greisemer, 1989)

Boundary Infrastructure: align and aggregate heterogeneous sets of regulations, standardisations and protocols that were themselves in fluid processes of negotiation.(Bowker & Star, 2000)

Category/Standards/Ontologies: bounded lists, assembled from multiple and heterogeneous elements in order to render worlds commensurable.

Chain: the metaphorical line along which people and things are assembled. Can be worked along back and forth to trace shifts and translations. (Latour, 1999b)

Collection method : something to collect observations and render them mobile /transportable – eg: notebook, tape recorder, laptop. (be prepared for research to be destabilised by connections that don't work)

Heterogeneity: proliferations of elements that differ.

Hybridity: assemblages of elements or actors which hold together. The stability of a hybrid cannot be assumed and will always be variably constituted and subject to reconfiguration.

Immutable mobiles: elements that solve movement between things which have contradictory properties.(Latour, 1987, , 2005b)

Order (v): to arrange, with some schematic purpose.

Order(n) of worth: the moral intent which may inform judgements. According to

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Boltanski and Thevanot these take the form of Civic, Inspired, Domestic, Opinion, Market and Industrial.(Boltanski & Thevenot, 1999)

Patience and perseverance: description is fraught with the very mess one is attempting to describe. Retrospectively, 'simply following' will get the job done (see reflexivity).

Plurality: the nature of things. Needs to be asserted if the researcher takes recourse to Euro American singular or theoretically simplistic closure

Reflexivity: to be exercised at all times, simply follow and let the actors tell the story

Site:Can have multiple meanings. For the purpose of method and in the case of information communication technologies these are likely to be 'rugged terrain', poorly mapped having fuzzy boundaries. May be in the form of a laboratory.

Symmetry: to be maintained throughout all observation and description

Trading Zone: more architectural than a 'boundary object' this concept may be useful for describing multi disciplinary work (people or things / people and things) where new technologies are created from collaborations that work uniformly through agreed interlanguages.(Galison, 1997)

Words: for rendering worlds - use those from the observed world itself wherever possible

Workaround: a hybrid solution that enables ideas or innovations to move forward; to assemble heterogeneous elements that hitherto would not associate.(Pollock, 2005)

Section Two: Assembling a 'site'

"If we can't make something, we have to describe it, which might take thousands of words, or somewhat fewer pictures. Designers have spent many [an] hour trying to describe something new and unnamed"

(Petroski, 2003, p.197)

"But there is no end to this" I said to Norbert. "We'll have to go from the Minister's office to the Minister himself, from there to the president and from the president to all their international counterparts. Why not go to Ronald Reagan, or the Chinese? And why not follow the chips to South Korea? After all- they too decide on Aramis' fate; they're its context. …

…Maybe we'll go to South Korea…but simply because the Aramis maze will oblige us to draw a picture of that corridor of its labyrinth…not because we have to take into account the international element or the technological infrastructure"

(Latour, 1996,p.123-124)

This section re-presents the work of making the prototype for the Media Clearinghouse. It is divided into three chapters. The first, a history of sorts, describes some of the associations along the trajectories of the development of the Clearinghouse concept. The second describes the assembling of a place to work and the working of designing an ordered infrastructure for an effective prototype to demonstrate the concept. The third describes two performances of the prototype as it traveled beyond the site of invention and into the worlds that it sought to enrol.

4. Locating the Laboratory

The Media Clearinghouse was dreamed of to be a single, hyperlinked access point that would work between the boundaries of a multiplicity of sometimes divergent interests that collaborate in the 'ecology'[34] of media worlds in New Zealand/Aoteoroa. If the connections between regulation, content, research and audiences could be rendered visible to all participants then more effective and informed media use and media policy outcomes might be mobilised. Creating the Clearinghouse was an attempt to migrate the forum facilitation performances of advocacy around children and media to new opportunities provided by emergent web technologies.

The notion of media worlds as ecologies informed the understanding of the prototype's Lead Researcher. Different groups cohere variably through a myriad of juxtaposed arrangements and brokered collaboration. Audiences, specifically, "children and those who care for them" (Zanker & Barclay, 2004), are embedded in networks of production, transmission and regulation. Although having varying opportunities for participation each group of interests plays a part in the whole. Advocacy for children in media environments has long been a complex area. Significant 'distance' between media use and observable effect can be created by developmental time. Further, for young audiences, adults act on behalf of children which adds an extra layer into the web of connections around rights issues. These complexities were ones the researchers who built the Clearinghouse were familiar with. Their challenge was to become familiar with how this knowledge might be re-

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[34] The use of 'ecology' to derives from political economic theories of media flows and recent sociologies of media production, reception and consumption. It is linked most commonly to a body of work tracing its roots back to McLuhan and "broadly defined as the study of complex communication systems as environments" http://www.media-ecology.org/media_ecology/. It is a term which gained weight throughout the project, used first privately and later, cautiously, in public documents about the site to "express the way that every element within a media environment is interdependent. Change one thing (eg. who makes programmes, or a wording of a bill, or who uses what media when, or media ownership rules) and it has effects that ripple through the entire system (the butterfly effect)" (Zanker, private communication)

presented into the genre of a web site.

Most unexpectedly for the researchers who embarked on the task, building a web site amounted to making a map of their territories. The task proved inexorably complicated since their terrains did indeed have which did indeed have weird borders (Latour, 1996). Legal and informal, mandatory and voluntary agencies, industry associations and government ministries were just some of the agencies getting the job 'done'(Becker, 1986) of managing content, standards and regulations for New Zealand media. Multiple worlds, but with high degree of interdependency, worked within very small economies of scale and often shared across unlikely boundaries (money, frequencies, production houses). It is this co-creation across boundaries that the researchers sought to make visible.
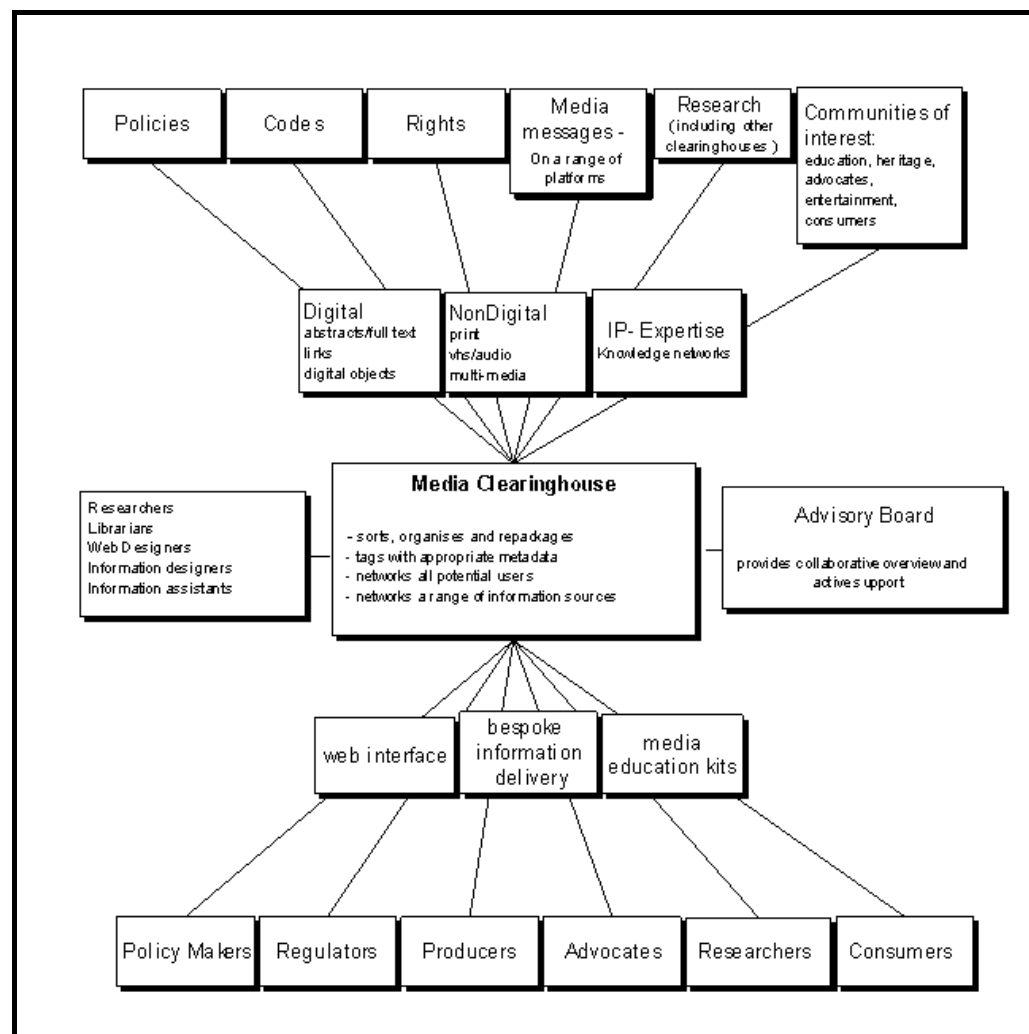

Figure 2: Clearinghouse Proposal Diagram

The Clearinghouse was stabilised as a concept worthy of development by the successful application to The CPIT Foundation[35] by staff at the The New Zealand Broadcasting School, Christchurch Polytechnic Institute of Technology (CPIT) for seed funding to build a prototype)[36]. The Foundation was established as independent charitable trust to work "in partnership to help fund innovative projects that can "make a difference" to individual students and staff, to CPIT as a whole, and through them ultimately to the community."

From the "eureka" moment (Zanker, 2006a) of the idea's inception, when out of frustration with existing practices to acquire knowledge with which to perform advocacy work, the germ of determination to create such a thing was planted; to the process of aligning worlds to enable money to flow into the project took some time. A brief moment of resistance occurred at the local café early in 2004 when, now embedded in other busi-ness while awaiting the outcome of the funding application, the researchers suggested to their Head of School the possibility of not progressing with the idea. They were encouraged to get the thing made. A good idea, now funded, it deserved to 'be done'. How hard could it be?

As it turned out, it was the hardest 'thing' either of its "imagineers"[37] had ever done. Realigning 'advocacy' and 'research' worlds resulted in a reconfiguration of roles for the researchers, their associated workspaces and the enrolment of new disciplinary

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[35] http://www.cpfoundation.co.nz

[36] http://www.cpit.ac.nz/schools/broadcasting. Little description occurs in this text regarding the parent 'institution' CPIT. Its educational bureaucracy is back-grounded, assumed as part of the 'second nature' (Thrift, 2004) of the worlds of this invention that 'competent' readers will know (Orr, 1996, 12). But it is important to make the point, as Latour does, that description can go onwards along the chains of invention and association as far forwards and as far back as the researcher chooses to go, (Latour, 2005b) or in this case, as far as the word limit allows.

[37] Imagineers or Imagineering was a term first used by the Disney Company - their term for creatives working on new blue sky products/projects, a play on Mousketeers. More recently it was part of the debate around digital innovation in New Zealand/Aoteoroa, for example (LIANZA, 2005) and (Brown, 2006).At the direction of the National Library a group of private and public individuals were collected to discuss possible directions for digital strategies. These "Imagineers" were described as " a group of people who operate in the web environment [and] developed fictitious personas of ordinary citizens who currently create material online. The purpose of this is to provoke acknowledgement that these people want to access collections held by repository institutions, and stimulate thought about how to address this user need." (LIANZA, 2005)

knowledges and their associated worlds. What was understood to be a process of aligning a 'database' that would link to an 'interface' and so enable access to knowledges hitherto locked in silos of expertise, evolved instead as a monstrous process of convoluted invention that was frequently unable to enrol needed skills or technologies. When they were available or willing to be associated, many actors proved to be incompatible or unable to be reconfigured to adequately, honestly and efficiently (Becker, 1986) participate in the world of representational work.

The changing names of the 'thing' itself tell stories of multiple transformations which attempted to signify the perpetually reconfigured shape of the map being drawn: 'pilot' became 'prototype', 'portal' became 'Clearinghouse', 'MediaSmart' became 'KidSmart Media'. Under the folds of each of these shifts, a myriad of reconfigured associations and connections, modifications and substitutions, fixes and workarounds – too many to fit into a single description – multiplied into a working 'information infrastructure'. Eventually, after it was truly 'real', a hybrid assemblage of code hosted on servers, linked and linkable to its own subscribed URLs, was sponsored, branded and launched at parliament in 2006 by then Minister of Broadcasting. The project, now Mediascape, was described as " a holistic experiment in knowledge transfer" (Zanker, 2007, p.7).[38]

The incredible multiplication of this monstrous machine (Miller, 1997) of invention was managed in part by relentless list making. As we have seen, this making of lists is one of the practices which works to invent and maintain constants and reconcile contradictions along the chains of reference of perpetually mobile worlds (Latour, 2007b). What follows, drawn from the captured traces in the record of the project, are descriptions of just some moments from those chains of invention.

The following vignettes render as lineal descriptions, the 'branching bush' (Latour, 2007b, p.3) of innovation that existed for a short time in rooms TV105 and TV110 of

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[38] The project that built Mediascape is another story that extends beyond the temporal scope of this description but signifies that the chains it describes did not end where this description does.

the Broadcasting School.[39] Work which was simultaneous, tangential, serendipitous and chaotic that was creating new knowledges while simultaneously describing them, was forced into an ordered, lineal description.

For readers who have, through their experience, assembled more mastery of the disciplines that act in this story than the researchers were able to, the work described might seem at once recognisable and at other times painfully clumsy and naive.[40] But that is the point! The reconfigurations that got the job done, crossed dimensions and reworked disciplines in previously unpredictable and unspecified ways, (Vinck, 2003,p.211) configured the very particularities of *this* project are what make the description a 'worthy' task.

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[39] Like the naïve scribbling of a child positioning themselves in the 'universe' this description of location could go on out into the cosmos. The reader will be spared that. But it is important to make the point, as Latour does, that description can go onwards along the chains of invention and association as far forwards and as far back as the researcher chooses to go, (Latour, 2005b) or , in this case as far as the word limit allows. Little description occurs in this text regarding the parent 'institution' CPIT. It is a further background, its educational bureaucracy assumed as part of the 'second nature' (Thrift, 2004) of the worlds of this invention that 'competent' readers will know (Orr, 1996, 12).

[40] During the course of writing this thesis the workarounds that built the navigation were presented to a class of sociology students, one of whom had been a programmer for IBM. Completely missing the point, he expressed 'pity' at the use of post-its which had solved the problem for the designers!

5. A Public Thing to perform boundary work

"In preference to cumbersome notions such as market forces or the irresistible thrust of technology, lets choose *assemblies* of *spokespersons* who bring together, during a single meeting, around a single table, different worlds"

(Latour, 1996, p.42)

To understand why the idea cohered in the office of our media Researcher one afternoon in 2002 it is necessary to outline some of the terrains to which she and her librarian colleague, who together conceived of and assembled the Clearinghouse prototype, were linked. A paper presented at a media conference after the launch of the actual site described the impetus for invention as follows:

Why did Mediascape seem a good idea in June 2003?

New Zealand has a deregulated media environment where scattered agencies make access and explanations of media processes unnecessarily complex. Few outside the industry understand the structures of media in NZ, even less why decisions made about them matter…

• there is no overarching policy think-tank (like OFCOM for example) charged with researching and contextualizing the media ecology for citizens and promoting media literacy.

• research that exists is scattered and difficult to access (there is no equivalent of the NORDICOM regional research dissemination or Clearinghouse on children,

youth and media, for example).

• there is no local tradition of incisive media journalism informing public debate. (Zanker, 2006c, p,3)

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This justification works the links for the project around the globe and back again. OFCOM,[41] the British regulatory body, was at the time the Clearinghouse was conceived, from the less stringent self regulator, ITC, being reinvented as part of key regulatory reforms that were reconfiguring the role of public broadcasting. Nordicom,[42] the Scandinavian centre of research expertise on children and media, seeded the idea for the Clearinghouse.[43] Together with a number of other key research institutions in the USA and Britain and one key lobby group in Australia,[44] Nordicom formed the network of information retrieval and collegial exchange. But New Zealand researchers had no local research repository from which to advance the idea of informed research-based democratic participation in what were very unique, specific and localised debates around public and commercial provision of media content for children

The media Clearinghouse concept existed at first as a dream for a 'small nation' without infrastructures of large scale media advocacy. In larger democratic nations the work of maintaining effective and responsive media regulation is spread across a range of specialist agencies and collaborating state organisations on a scale that affords depth and breadth of knowledge dissemination. States work actively to facilitate media institutions, lobby groups provide political voice, and regulatory agencies enable research and development. The patterns of intersection between these agencies are drawn by their scale and stability, and especially by their budgets. Only parts of the intense complexity of this set of associations are mapped by laws or regulations. The rest belongs to political granularities (Star, 2002) which are peculiar and specific. The Media Clearinghouse was thus a response to the unique nature of New Zealand's regulatory system – or to be more precise – de- regulatory and self regulatory system - effectively, an innovation inside an innovation.

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[41] http://www.ofcom.org.uk/
[42] http://www.nordicom.gu.se/Clearinghouse.php
[43] http://www.mediascape.ac.nz/content/about_us/Clearinghouse
[44] Young Media Australia, Kaiser Foundation, Markle, London Business School.

Other work weaving around children and media to which our researchers were variously attached was the politically engineered TV-Violence Report [45]. This report ultimately played a strong role in the establishment of the Families Commission, one of the sponsors for the Media Clearinghouse. The report also connected the researchers to the work of the Association for Children and Youth Aoteoroa (ACYA) who were responsible, with the Ministry of Social Development for the "*Making it Happen document, a statement of need for New Zealand's young people*" (*Agenda for Children*, 2002).

Informing much of this advocacy work was a prescription of rights that was working its own presence globally - The United Nations Convention for the Rights of the Child (UNCROC). Ratified by the UN in 1989, New Zealand became a signatory in 1995. Its second periodic report[46] was submitted in 2000, the same year that it appears in this version of the Clearinghouse story.

Forum March 2001

In Parliament's Great Hall the vaulted ceiling, ornate plaster work ,delicate stained glass and an army of chairs, host a one day forum on children and their media for a carefully shuffled mix of advocates, policy makers, politicians, media creators , media marketers and academics who share interests. Only one child is present, a baby. Her mother belongs to the community advocacy group, The Children's Television Foundation (CTF), which is co-hosting the forum with the Office of Commissioner for Children, another non-government organisation (NGO) that worked to advocate for children's rights.

Microphones are the only augmentation of speakers' words from the podium - no PowerPoint. A green booklet circulates amongst the speakers and audience – an asserted rendering of UNCROC. It is the boundary object through which, for this

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[45] http://www.tv-violence.org.nz/
[46] http://www.myd.govt.nz/Rights/uncrocinnewzealand.aspx

forum, the diverse interests have been enrolled, since the agenda has been written to specifically address a number of its key articles.

Many traces from that forum made their way into the prototype. Although both researchers attended they were not yet closely associated through their work.[47].
Three presentations held in the memory of the researchers exemplify the connections between the worlds they would later attempt to map. A fourth contribution was made by the Lead Researcher of the future Clearinghouse project.

The then Minister of Broadcasting, The Hon. Marian Hobbs, defended children's right to imaginative play. To this forum the 'Minister' positioned herself as a child, who later became a teacher, who privileged imaginative worlds. Her words painted an image of child self playing with little plastic horses in the sand. The Minister drew connections between policy and participation by personalizing the local experiences of the child with the wider processes of media provision. This minister was, at the time of the forum, under enormous political pressure for her perceived poor performance in the translation of broadcasting reforms inherited from a previous minister. That this ultimately contributed to her replacement in that portfolio this memory, weaves a poignant 'subjectivity' into the 'objective' machinations of 'government'.

An advertiser cut a swathe across assertions at the forum of the negative effects of commercialism on children by describing her own children's passage to bed. Rendering a detailed tale of her daughter's relationship with her dismembered 'Barbie doll' and her son's toys which littered the stairway in imaginative orders beyond their makers' intentions, the speech asserted the child's right to commercial citizenship.

A media innovator, speaking from the floor, cut across the debates about control and regulation by observing that censorship or codes which controlled dissemination of

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[47] The network of connection which saw them both at the forum is a dense one and would require many words to describe with adequate nuance.

media messages would be a pointless exercise as media formats and content converged. His assertion was that the adult responsibility was to inform and enable the child to be a discerning media user. [48]

A Media teacher and researcher, founding Chair of the Children's Television Foundation, suggested that parents often fear new media and what it might bring into children's lives. She commented that, whilst caution is sensible, the opportunities new media provide for all should be embraced. Media literacy is the bedrock for political and cultural literacy these days…adults and children alike. Many parents feel anxiety and guilt about the role of media in their children's lives because the headlines are often alarmist. What the forum of the Foundation offered were ways to understand and use media content and make wise media choices to suit each and everyone of our families.[49]

The Children's Television Foundation

CTF was no ordinary 'lobby' group. Taking its mandate from the United UNCROC, CTF was formed in 1987, the same year that UNCROC was first ratified, as a response to the feared acute impact media deregulation would have on children's television production. A group of academics who were also parents established the group as a research based foundation in response to a series of reforms through which the New Zealand media regulation system was being turned into the world's most de-regulated regime (Comrie & Fountaine, 2005, p.101; Perry, 2004, p.77).[50] Between 1989 and 2004, entirely voluntarily managed, this hybrid 'community' group played a significant role in negotiating arrangements between audiences, broadcasters,

[48] Personal Notes from the 2001 forum.
[49] The last excerpt was sourced from a version it details in a speech delivered at Mediascape's launch (Zanker, 2006b)
[50] More detailed descriptions of this shift in regulatory arrangements of media policies in New Zealand, specifically with reference to broadcasting have been written as part of the ongoing production of reports, commentary and research that is associated with its co-construction. See in particular (Millwood Hargrave, Lealand, Norris, & Stirling, 2006; Perry, 2004), (Brown & Price, 2006), (Farnsworth & Hutchison, 2002),

advertisers, governments, and broadcasting and advertising content.[51] Membership was a small but multi disciplined group of parents, mainly mothers, based in Christchurch/Otoutahi, the third main city in New Zealand. It was separated from the weighted population and organisational nodes of the north by a choppy ocean strait and an overpriced air transport network. Before widespread use of the www and 'e' communication and despite these geographical, economic, social and bureaucratic impediments, CTF succeeded in engaging and being engaged in discussions that circulated around the cafes and ministerial briefings in the capital city and bureaucratic hub, Wellington/ Te Whanga-nui-a-Tara about media regulations, content and use.

New Zealand's broadcasting history has 'traversed the spectrum of broadcasting forms' (Perry, 2004, p.77). The concerted dismantling of public service broadcasting by the fourth Labour Government had crafted a curious and politically innovative mix of regulatory agencies which cohered to and around but were not directly within the government's stable of portfolios. Via a series of bureaucratic translations [52] broadcasting (literally the transmission of signals 'broadly') content was regulated by a binding set of codes, endorsed via a legislative hierarchy under the Minister of Broadcasting and adjudicated via a quasi governmental complaints agency 'The Broadcasting Standards Authority'. Standards for advertising and print media meanwhile were dictated by a voluntarily agreed set of codes written and rendered binding (but not legislated) by the Advertising Standards Authority and the New Zealand Press Council.

The connections that evolved to work the relationships between these agencies and others, for example those that distribute funding of content (NZonAir), became highly complex and interactive. Between them circulated the exchanges and interests

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[51] A good description of this work and the regulatory reforms that inspired it can be followed through (Zanker, 2004). Work after that can be followed through such documents as the "*Getting it Right: Guidelines for Children and Advertising*" (NZTBC, 2001) and various documents from The BSA (www.bsa.govt.nz)

[52] For more detail on this story see (Brown & Price, 2006; Farnsworth & Hutchison, 2002; Zanker, 2001)

of professional committees and associations (for example The Radio Broadcasters Association (RBA) and the Television Broadcasters Association (TBC) whose membership often included representation from the same small set of individuals and/or representational agency roles. Such a high level of plural interaction is necessary because, although the lines of authority are drawn neatly around some different content types, lines of transmission and reception were not. Deregulation saw the creation of corporate style entities such as state owned enterprises (SOEs), as a solution to the small economies of scale in New Zealand. In a variety of guises, a hierarchical control structure worked congruently with market systems (Perry, 2004, p.83).Government funding as license fee or taxes, was blended with advertising revenue on all free to air television channels under a 'mixed economy' (Comrie & Fountaine, 2005, p.103) solution to fund the public service broadcasting imperatives.[53] Thus a content mix unique to New Zealand's state broadcaster, Television New Zealand (TVNZ), runs advertising ubiquitously on both its channels. The main monitoring for compliance of standards for the mix of content that emerged from this mixed economy is via complaints, usually from audiences and after the fact of transmission or publication to each relevant authority.[54]

A consultative base is one of the key mechanisms of a self-regulatory system. Negotiated rather than prescribed compliance means that collaborative work characterises this form of regulation. The interests that achieve and maintain stability tend to be those that can work coherent consultative outcomes, but much of this work is achieved through tacit communication. As a forum to facilitate informed debate with reference to the particular interests of children, CTF explicitly sought to ensure discussion between a range of interested agencies engaging as many interested parties as possible, and with transparency and accountability.

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[53] Private interests have also entered the market with the same mix of funding as free to air (TV3) and satellite (Sky) transmissions making the deregulated infrastructures that deliver of publicly funded content even more elaborate .

[54] Most producer groups have established pre-vetting mechanisms to ensure compliance of potentially contentious material prior to transmission. These are forms of self-regulatory monitoring.

The Children's Television Foundation and the TVNZ Bill

In January 2002, the Chair of "The Children's Television Foundation" (CTF), our Librarian Researcher, received a call at her home, from the founding chair, our Researcher, now a senior lecturer at the New Zealand Broadcasting School (NZBS). An applied tertiary institution the NZBS trains television, film, digital media and radio media specialists and undertakes research in those fields. The lecturer advised that the final date for submissions to the Select Committee on an important bill, The TVNZ Amendment Bill, [55] was two weeks away. The bill included a charter that sought to reassert interests for public service broadcasting into the quasi commercialised free to air television infrastructures of New Zealand/Aoteoroa. Although now at wickedly late notice, a submission from CTF, who had submitted under a previous committee on the original draft of the charter, would be an important addition to the debates about the Bill's content.

The two women (being, in common, hybrid selves as mothers and academics) were associated through the hosting of CTF at the school. Far from simple, this hosting was a fragile brokering by a number of teachers and managers who had ensured the group's survival by granting a space at the school. With great celebration a desk, a cast off from another department had made its way via a chain of discharges on the institution's asset sheets, and been installed into a semi –ordered office/library space next to the lecturer's office. Files, minutes, collections of publications and society archives that had been distributed around member's homes were assembled on shelves. The Foundation name was written in whiteboard marker on the door. [56]

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[55] New Zealand, a member of the Commonwealth of Nations, executes its parliamentary process according the Westminster System. An elected parliament hears and reviews bills proposed by the government or private members through a staged process of debate, culminating in a final reading and enactment into legislation. A bill, generally after its first reading, is referred to a Select Committee, and submissions from the public are invited. Submission in written form can be supported by presentation. A Select Committee report is produced from the deliberation of the committee that advises the house of any refinements or amendments recommended to the bill.   For more information on this see www.parliament.govt.nz.

[56] This stabilising of the trappings of bureaucracy enabled a shift in the way that business was transacted by the committee. Meetings were now held at the school instead of in members' homes (necessitating further extension of security and trust as the chair and secretary were allowed after hours pass code access). However the shift to a more 'professional' set of practices proved to be the last in a

The completion of this installation was the acquisition of a computer for the space. Justified via a set of coded projects, that were funded from the lecturer's research, the computer was to be legitimately utilised by the Foundation as an extension of community capability building by the school. Co- located was another office, shared by two other lecturer/researchers. An intricate assemblage connected the performance of the Foundation in the new space to these three people, their academic and physical workspaces. Shared keys afforded access to a phone in one office and a printer in another. A newly conceived research centre, also to be hosted at the school, facilitated access to the computer network.

Although admitted access to the physical spaces through semi-unauthorised workarounds, as a non – employee the Chair could not be permitted to access the computer networks of the institution. To work around this she was given a small role as assistant in the establishment of the research centre and given a proxy location from one of the lecturer's accounts.

The co-location of the Foundation and the research interests of the lecturers, and also the 'head of school' whose office was located upstairs, meant the interests of the group now had the opportunity to benefit from the circulations of knowledge around media policy which flowed in and out of the school. Each lecturer was connected to media networks practicing within the production and regulatory terrains that the foundation continually sought to engage with but often struggled to remain informed about. Co-location also meant the possibility of an invitation to the local café where the 'real' business of research and reflection took place and sometimes meant inclusion in lunches with visiting speakers. It was via these 'meetings' that the Chair and the past Chair collected many threads which began to overlay themselves into the eventual Clearinghouse concept.

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series of incarnations. Its metamorphosis into the Clearinghouse project, despite an attempt to reconfigure it as a trust which could support the Clearinghouse, ultimately proved to be its final incarnation and the group folded officially in 2004. Such reconfigurations of NGOs that include migration and new opportunities for association enabled by new technologies have been discussed by

Having accepted the challenge to write the submission on the TVNZ Bill, the Chair now sought a greater understanding of the intricacies of the broadcasting 'machine'. By following a myriad of leads tossed at her by the lecturers, she was able to assemble an argument that cohered. The submission, in multiple hard copies, was couriered in the nick of time.

The submission cover document included a request to be heard by select committee. Having no concept of what this entailed the Chair had complied with this part of the submission process. It was with some surprise that she answered her home phone one afternoon to the secretary of the select committee, advising her of the date on which she was requested to appear at Parliament. The eventual success of this presentation was to convince the select committee and some of the key assertions of the submission were consequently enacted.

> "…The Children's Television Foundation submits that in relation to children's programming the bill does not give sufficient recognition that children should be specifically considered whenever seeking to fulfill all Charter objectives. We recommend an amendment to the Charter `preamble' to state that, in programming for particular audiences, TVNZ is to consider all relevant provisions of the Charter. This amendment is to ensure that Charter objectives are considered when programming for children." (*Television New Zealand Government Bill: Select Committee Report*)

Not progressed along of the chain of the bill, however, was the recommendation that effective monitoring be established to ensure such considerations were effected. Monitoring of the system still rested on a complaints based system but access to the material on which reasonable complaints could be made was embedded, often tacitly, in networks not accessible to the audiences who were responsible for complaining.

Bach and Stark on NGOs (Bach & Stark, 2004; Callon & Rabeharisoa, 2003).

Digital Strategies

Towards the end of 2002 the Chair of CTF had been employed to work on a research project at the Broadcasting School: a follow up study of children and their media use. Although now sited in a media world, libraries were where her professional connections were rooted. The theme of that year's conference for the Library and Information Association New Zealand, 'Winds of Change," resonated with her particular blend of interests in the 'winds of change' that were being predicted, for convergence of information platforms, audiences and content. At the conference, the reinvention of the information hierarchy and with it the role of the traditional knowledges of the library profession and the reworking of information access via the networked web of electronic access, was debated between library and information managers. Knowledge Asset Management specialists from Glasgow University and The People's Network of the UK gave plenary sessions.

A striking scenario, delivered by Chris Batt, addressed a ripple of concern running through much of the conference debated: What were the implications for the profession from the new and, some thought dreadful, Google search engine and its associated "googlisation" of information? Batt asked the gathered audience to imagine a challenge. The doors of the local public library are locked. One small mail slot, the only means of access. Inside, librarians stand at the ready. A single query of a couple of words, written on a slip of paper, is slipped through and falls to the floor. Swept up it is passed around as the librarian rush to gather answers from their collection….. At an internet café along the street, the same query term is typed into Google. … Which one he asked, do you think would deliver the answer most efficiently and quickly?

A researcher at the newly established New Zealand electronic text centre (NZETC) introduced a relatively new coded player to some conference participants. Her talk was entitled "What is XML?". Now ubiquitous to the back end operations of many internet protocols and standards, XML is a background program language that combines text and extra information about the text to facilitate the sharing of data across different information systems, particularly via the internet. In 2002 though, it was just beginning its journey beyond the worlds of programmers and database

designers and was not yet stabilised as a given for global exchange.

In accented rectangles throughout her notes the chair of CTF collected the wisdom of the speakers and folded it into her repertoire of understanding of what digital futures might be ahead. Thus she was positioned to notice when strategies around digital access and community building began to circulate out from the bureaucratic hub and reach the Broadcasting School.

Threads Weave Loosely

By 2003 the role of chair for The Children's Television Foundation had been passed on and now the immediate past chair was simply a member of a newly arranged committee. Publicly the 'group' maintained its profile, collaborating with the New Zealand Television Broadcasters Council on the 2003 release of "*Getting it Right: Guidelines for Children and Advertising*" (NZTBC, 2001) which paid particular attention to the limits on advertising to children in pre school viewing times. Privately it was depleted in membership and sinking under the weight of trying to maintain a role in policy network without the attachments of infrastructure (available to most other agencies in its terrains of connection).

This was most evident in the inability of the group to collaborate effectively for a submission to the working group on TV Violence despite the fact that one of the remits for the working group was to "To bring about creative dialogue between viewers, interest groups and broadcasters that strikes a balance between the freedoms of broadcasters and the attitudes and expectations of viewers and communities" [57]

Meanwhile, after much delay the TVNZ Amendment Bill was finally enacted and "the Charter" became a besieged actor in the funding rounds of production and programming schedules of TVNZ's transmission. Also implemented were changes to the operational structures of the company that required it to run as a profit based

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[57] http://www.tv-violence.org.nz/pr.html

enterprise which would return a dividend to the government. The extent to which public service expectations could be met while meeting this requirement was a destabilising theme in much commentary. Many argued that 'public' was not compatible with 'consumer'. However, when the then Minister for Broadcasting, The Hon Steve Maharey, addressed a group of advertisers about the newly implemented Charter he explicitly reassured them that there was no suggestion from government that under the charter "the viewer as citizen completely displaces the viewer as consumer" (Maharey, 2003).

At that time, broadcasting was still by far the dominant means of transmission of media content. Nearly 100 percent of New Zealand homes had a television set as compared with only 50 percent having a PC or owning mobile phones.[58] But new media technologies were rapidly reconfiguring the way that 'media' was done. Consumer/citizen hybrid collaborations acted as producers of their own media experiences and were dubbed a 'revolution' whereby broadcast schedules were being transformed into 'me' channels via searchable data bases and where the "old media silos break down and broadcasters publish text and newspapers publish video" (Norris, Brown, & Pauling, 2005, p.5)

As platforms 'converged' so did previously segregated content delivery, challenging the idea that media for any audience could be regulated through specific sets of inscription. The importance of informed debate on these matters became all the more relevant. Perhaps it was time to remap the boundaries and migrate the work of 'consumer' advocacy to take advantage of these opportunities being offered by new hybrid technologies for reconfiguring and co-constructing the work of negotiating New Zealand's media terrains.

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[58] By 2006, when the Clearinghouse was launched, the ratio was closer to 1:0.7 for each of these media with the rapid uptake of DVD players, internet access and specifically broadband access increasingly evident. Neilsen Media Research, National Readership Survey, January to December 2006. http://www.nztbc.co.nz/research/story.html?story_changing_home_enviroment.inc

6.Vignettes of Invention

"workers decide how to go about making representations [of knowledge about society] by seeing what is possible, logical, feasible and desirable, given the conditions under which they are making them and the people they are making them for"

(Becker, 1986, p.23)

Hybrid Designers

June 2004

Winter…. The Librarian/researcher has a terrible flu and doesn't know if she'll make it through a meeting with the web designer and last long enough to drive the long round of collecting the kids from school. The Designer is traveling to the Researcher's university space. Allocated for her to work on her thesis, it is a small office in an old converted house which the Department of Sociology dedicated for postgraduate working spaces. The room is freezing but the computer is new and the connection speed to the internet fast. Through collaboration they have worked an assemblage of connections that get the job done. They will look at the latest version of the prototype of a website, logging onto the designer's server via the Librarian/researcher's student log in, leaving the university network and going behind the walls that keep the unfinished thing accessible only to those linked closely to it. The designer will bring her laptop, loaded with the same version of site and the design software required to make changes as they agree them. Although the room has a spare network cable, she cannot access her own server via the university network. Being a 'stranger' to it, she has no protocols, passwords or rights. So changes will be made on the closed system of her laptop and travel back with her for uploading later.

There is pressure to get the prototype finished. News of its emergence has been put about and potential supporters, with whom financial attachments will be made, are expectant. The website is being designed to explain New Zealand's fragmented and deregulated media policies and practices to as many of its communities of interest as can reasonably be addressed in one information service.   It is an entirely new concept and one which is hard to explain – a portal of sorts but performing eventually as a forum. This notion is a reworking of the goals of an advocacy group, The Children's Television Foundation (CTF) that had functioned for about 15 years as an agent of communication about issues around children and media between parents, producers, broadcasters and regulators. Both the researchers working on the project are strongly attached to the now, disassociated CTF. Both past Chairpersons, they have recently mourned its passing – unsustainable as a voluntary enterprise. The website is an attempt to reconfigure the goals for advocacy and forum facilitation using new media.

During the passage of its invention the project's terms of reference have shifted from 'pilot' to 'prototype'. At one point, when pressure mounts to launch what they have designed as a fully fledged web site, the Librarian/researcher makes a decision to describe it as a prototype. From the first demonstration of the pilot, which they consider sketchy and flawed, it has been perceived as professional and comprehensive. This is far from their expectation or their perception of their achievements so far. They do not consider that their design is nearly ready to launch. It is skeletal, requiring flesh and substance. So they conceive of the analogy of the prototype as chair. It can be sat on and demonstrated but would not be expected to go into production on its first presentation.

 "The angle of the legs might need changing" they say, "or it is uncomfortable to sit on…".

This silences those who would rush them and their site out to the web public. There is much database design to be done. Sorting, classification, coding…..

The unwell Librarian/researcher has pushed herself a long way but she suspects the limit of the hybrid of 'self' has been reached this day. As she trudges against the freezing wind along the road which connects the old, cold, converted house to the modern engineering school that houses the café, (sometimes she thinks the university runs on coffee) she rings her husband - her mobile phone connects to

his office 'land' line in the depths of the hospital where his mobile doesn't work. He might be able to pick up the kids so that she can go home immediately and privilege the virus by lying down and resting?... No, he has a clinic and back to back meetings. He is deeply embedded in networks of his own – other bodies' pathologies need attending to. The hybrid of parent/ student/entrepreneur is weighted back onto our Librarian/researcher.

…The web Designer texts to say she will be half an hour late. The Researcher trudges back with her warm coffee and knows she should go home… but they have a deadline to meet. The prototype is only a week away from the date agreed for 'completion'. It will carefully distributed to prospective supporters. It will also be housed on a server, "hidden "from the web via the device of a complex, undiscoverable URL. This address can be emailed to selected stakeholders and opened on their digital desktops. But there are risks with this. The look and feel of the design depends on so many alignments of software that may, or may not be present. The least risky is to fix it onto CD and render it mobile by post!

When the designer arrives, she discovers she has not packed some attachment for her laptop. They can look at the site but cannot manipulate it! This will add time not easily afforded at this stage but nothing can be done to immediately workaround the problem. Pencil notes and sketches in the designer's notebook will carry the new design decisions back to the designer's office/home. She will make amendments and send an email with the new link that will direct the Researcher onto the server. The Librarian/researcher knows from experience that this translation will be partial. Not all the changes discussed will travel and they will need to retrace and reinvent them another day.

Talking it up

"We need a meeting!" said by either member of the research/design team, the Researcher or the Librarian/researcher, tended to mean: "we've got too many messy ends that need tidying and agreement so we need to get them in order" or "progress seems to have slowed, we need to do some analysis of what to do next" or "something isn't coming into line, we need a new strategy". The ebb and flow of meetings between the two researchers can be inferred from the archived traces left behind in the

project's red folders and boxes that line the offices from which the, now realised Media Clearinghouse website, is maintained. At the beginning, of course, there was no assemblage of 'sites' or located practices.

From meeting locations can be inferred something of the kind of work and the extent to which the researchers negotiated their exchanges around the content of the work to be done. Meetings in the bookshop were for creative brainstorming of big picture ideas, meetings at the modern café up the road were for reporting to senior staff, meetings in the offices were for nutting out detail or presenting the project to others.

During its early phase of invention, the scale of the project tended to either enthrall or inhibit those who met it. The researchers had identified skills, knowledges and tools within their own institution that they thought they may be able to enrol. Their object was to devise an assemblage of exemplars that would be "small enough to do but big enough to show"[59] the potentials of their idea. Of significant concern to them was the requirement for the pilot to demonstrate its vision in document form – a business plan perhaps? The other main need was to secure a 'Database' that, as the researchers understood it, would feed the 'Interface' with content. For this they had already made connections with another pilot project undertaken by the Library's Information managers. A third, and most pressing, problem was where to locate the work?

Assembling the 'laboratory'

For the researchers, working back and forth along expanding chains of association that lurched in a seemingly endless series of connections and acquisitions, the list of attachments requiring assembly became a very long one indeed![60] The speed with which the project necessitated new connections was simultaneously so rapid as to

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[59] Personal notes.
[60] See Latour's reference to the relative length of a "list" and the "thickness of things (Latour, 2007a, p.140) and Bowker and Star's discussions of the importance of lists for organising worlds(Bowker & Star).

make full comprehension of them impossible and so fraught with impediments as to repeatedly stall progress.

The work configured the spaces occupied by the project. A new desk was reclaimed at the back of the school "library". This library, more a set of associated collections, was another project struggling for recognition and realisation. Periodicals, video recordings, official publications and archived course work were grouped in varyingly ordered piles and boxes. A fledging catalogue for the recordings needed resources to see it completed. Most recently, the room had housed the school's technician and these collections had competed with a cacophony of dismembered hardware, wires, circuit boards, orange peel and banana skins. A space at the back of this room, recently vacated by the technician and his things, became the first site to be colonised for the project's 'laboratory'.

The process of working the design was as much about working protocols. A computer was brought to the room. A complex working of budgets and coded allocation meant that instructions could be given to a technician to install it and render the profile compatible to the newly allocated password of the Librarian/researcher who would use it. For some time it remained useless, disconnected from the network of wires and cables that joined the desktop hardware, via the desktop software to the myriad of data worlds beyond. The computer was positioned on a desk on the left wall at the back of the room. The network cable that could connect it to the series of hubs and switching boards that would allow the flow of digital messages back and forth was on the right side of the room. It was technically possible for a simple extension cable to cross the divide between them. But this technical solution was disallowed by the IT department. Located elsewhere but controlling the work by a set of protocols for use, the department allowed only direct connection from network to machine. A requisition to move the cable was written and took its place in the queue of numbered IT tasks. Seemingly randomly, the number was up. An IT technician came to look at the room and decided the best way to connect the computer was an extension cable!
The project was "live".

Before any 'real' work could begin, the new Researcher on the project had to stabilise

assemblages of access mechanisms to physical and digital spaces. Moving data between the human actors in the project, researchers, designers, writers and system builders required layered practices that depended on whether the person or the file had access to the institutional intranet. An intranet is a bounded network within which multiple inter-languages operate to facilitate communication between and amongst people, digital objects and information infrastructures. To enter the world of an intranet requires authorisation, confirmation of contracts and allocation of standardised addresses. Only then is it possible to work information in and out of the wires of the 'networked' hardwares and softwares controlled by the protocols. Until then communication inevitably breaks at numerous dead ends. A 'member' is necessarily either logged in or out, there is no in between.

Along the chains of, undeniably, 'obligatory passage points' of access and operation in an intranet, most visible is the username and password which must be executed exactly through keyboard, desktop machine (that is the hard, physical desk) , network and software to depths of the network and back out again. Vast numbers of alignments then deliver back to the desktop (that is the soft, digitally displayed desktop) the user's profile that has assembled permitted actions. Hybrid hierarchies of access enable or disable the functionality of the network via distributed bureaucratic and electronic performances. Having been allocated or acquired, the login protocol works locally and at a distance. No longer 'locked out', the protocol allows the user to move digital files as far from the institution as the worldwide web goes. Once connected across and beyond the worlds of the Broadcasting School the project had acquired sufficient attachments to be able to attempt to enrol the different competencies it required to assemble the prototype.

Only some of the researchers' work proceeded as a journey in and out along these chains of connection to the web. In the email traces there are very few between the two researchers that directly communicate the work. Those that exist between them are mainly forwarded communications from other actors – humans or references to other websites. As actors were added to the work, this kind of exchange grows in number – duplications where each Researcher sends the same copied message –

capturing the connections, ensuring each is aware. This deficit of direct emails between researchers, whose work was located in adjacent offices, exemplifies that it was meeting and talking through the work, mediated by an expanding cast of assembled things that got the job done.

Working Invention

Inventing the prototype was entirely a matter of the researchers following their noses through a range of disciplines to which they were variably attached. Pooling their respective knowledges they instinctively began by mapping the worlds they knew. Where organisational theory would have the process streaming seamlessly, like the conforming lines representing tasks across a gant chart, the experience of invention was erratic, lurching from flashes of inspiration which rendered creative "fits" to floundering in disjunctions and disconnection.

Work processes for the new digital space were reconfigured versions of methods developed by the Researcher from her years of teaching and research. Work became about collecting, 'just in case'. Everything was collected during stages of inception because there was no way of knowing what would be useful. This created its own confusion. As the management of people and things continued, repeated shifts and re-ordering around the co-location of the project's 'collections' was a key task.

At every meeting each Researcher had pen and paper and, at those in the offices, an increasing cast of whiteboards, would be present. This perpetual recording saw each Researcher inscribing her own version. Together a co-constructed version was mapped in real time on a board, or boards. Both sets of individual 'minutes', partial records replete with arrows and doodles, apparently random but in fact strategically scribbled names or sundry details would be punched and filed together. This combining of informal representations built up a repository to which the researchers often referred to clarify or prompt agreed detail.

The researchers had been exploring content and system design options, models for

information infrastructures and content dissemination. It was difficult for them to discern what was already invented, that could make the job more straightforward, and what needed to be invented "in house" due to the original nature of what was being attempted. An array of elements, the partial and the possible, the stable and the imagined made their way to the 'laboratory' in the form of documents, names of people attached to potentially configurable solutions, maps of government ministries, portfolios, standards, protocols and policies… All were relocated in ever reconfigured associative practices that forced the relationships between concepts and objects.

Whiteboards provided the means to display and manipulate the details being assembled. Ideal mediators they performed as flexible, visual and shareable. In the co-construction of the elements of the prototype, a total of five whiteboards, having varying degrees of mobility and flexibility, were re-enrolled for the project's use. These actors became the barometer of progress, sometimes dormant for weeks on end, sometimes at such a premium that the researchers dream of acquiring a whiteboard with printer that would produce immediate inscriptions. That would have been luxury! Instead they were ecstatic to receive a cast off from a lecture room upstairs which the Librarian/researcher spent a morning scrubbing with household cleaner that the Researcher brought in especially for the task.

Between the researchers there evolved a seamless understanding of when a discussion was about to migrate to the board. Ideas to words to ink – stabilised concepts drawn in a neatly flowing script…

The Researcher writes because the Librarian/researcher's scribbly, uneven letter forms annoy her…and because she thinks best when she is writing. Sometimes, when a contribution is too hard to verbalise, the Librarian/researcher will take the pen to literally 'draw' an idea or a connection out but as soon as they both know the idea is safe she will hand the pen back. Most often the Researcher erases the new writing and neatens the form, always careful to replicate the inscription exactly.

Newly drawn plans are left up for a while to see how they rest and 'fit' with the ongoing work of the project. Like new initiates they await induction. If, in these newly created sketches, the terrain of the idea has not yet been fully captured, one of the researchers will tinker with the idea to the side and call the other to see what she thinks.
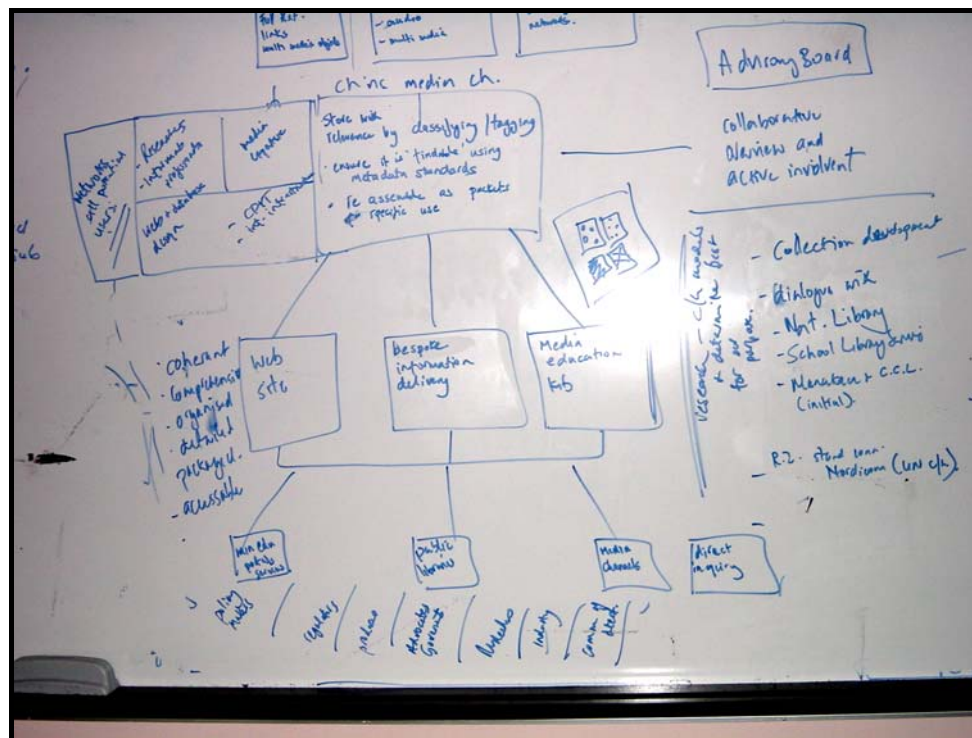
Figure 3: Whiteboard sketch of the Clearinghouse which preceded Fig1.

Eventually they are inscribed to paper and filed in the red folder which collects all the documents for the project in ascending chronological order. Minutes, drawings all kept for prompts and record. Some maps which depict the project process itself rather than the shape of the site go straight to paper. They do not require the formality or weight of the whiteboard.

The cleaning of the whiteboard is almost ceremonial. Sometimes initiated by the urgent need to get more mapping up , sometimes a matter of agreed sense that it was "old news" and stable enough to pass into the fact of the work, this cleansing is another negotiated work, agreed step by step…

The whiteboard eraser poises and attacks.
"…That can go" The eraser cuts and wipes a section from the board.

"Keep…" The eraser moves on and positions itself over another section of marks.

"Have you go this all down?" as one writes and one wipes.
"Yes… it can all go now"
Broad sweeps and the marks of detailed negotiated agreements disappear.
Newly cleaned, the board awaits a new design problem…

Planning a 'portal'

> '…The grandest dreams [are] articulated and tested on paper and thereby communicated to those who would have to approve, support, finance, and assist in designing a project'
>
> Petroski in (Suchman, 2001,p.167)

Also assembled to get the job of building the Clearinghouse done was a team of people who, as a hybrid representation of research, bureaucratic and budget function for the project and beyond it the school, had variously distributed responsibility for seeing it to completion. The first formal documents produced by this team are a set of minutes and a draft of a proposal of how to proceed with development. The minutes of a meeting between the researchers, the Head of School and the Head of the Research Centre lists the proposed stages that the work would attempt:

Stage One (March)   Planning the Encompass Project Pilot

Clarifying possible stakeholders

Rough draft of Proposal document

Stage Two (April)   Deciding on collections/ containers and objects suitable for the project

Implement ENCompass conversion, refining content

Stage Three (May)   Continue implementation and refine

Design creative interface

Stage Four (June)   Creative interface finalize.

                                            Finalise Public proposal for potential sponsors

                                            Present to Library Staff.

The notion of stages, evolutions of some ordered development, was a significant structuring tool used by the researchers in explaining their work to themselves and others throughout and beyond the prototype. Defining where a stage began and ended tended to relate, locate and associate tasks as needing immediate attention or being of lower order priority. It ordered piles around the offices, tagged matters for inclusion of meeting agendas or simply determined that a meeting needed to be called.

The other set of minutes that summarised in more detail the interests of the project is headed: *NZBS Media Clearinghouse: Mapping the future.* Each of its carefully ordered groups of words carries traces that weave the worlds that the Clearinghouse was seeking to align. It details the associations already in place for the project as well the perceived deficits that need to be filled in order to build what was then simply called "The Portal".

Under "*Core Business*" this list of aims includes:

> "…to comprehensively render accessible information not otherwise readily available without significant knowledge of the industry and/or media issues".

A casual reader might assume this use of 'information' and 'knowledge' in the one sentence was accidental. However, above it, under the heading "*Principles of Knowledge Asset Management*" we find a clear articulation of the difference where knowledge requires an application of judgment and "requires human understanding". The document further asserts that free availability of information which can be

> "utilised by communities of interest and practice interest networks (thus the 'sovereign right to an equipped citizenship' right to this knowledge).

The carefully constructed principles of this first proposal draft fold the wealth of expertise collected by the researchers in their career trajectories to date.

Also folded into these two first inscriptions is the order against which the project was measured. The lists 'simply' detail actions and actors with the various competencies that had the potential to be transformed and attached to the project. In fact these 'players' moved (or not) towards or away from the intended product of innovation. Called here the ENCompass Project Pilot, for a software manager of data intended to be enrolled for the Clearinghouses purposes it will take a much smaller role than imagined. Other key actors, present at the outset, whose chains we will follow in this description: the design interface and the proposal and possible stakeholders remain variably attached to the chain much as imagined. A new actor "the navigation", being the list of categories that order a web site, will join the team whilst "collections", one of the founding members will quickly disappear altogether and not be re-associated in this story.

The Proposal – a map in words

A true monster in the making, later to be described as "a voracious beast that would need constant feeding"[61] , the complexity of the concept quickly emerged as needing a more detailed assemblage of explanations to demonstrate it, a thing that would show the scope of the idea; that it could work to describe how such a map could be made. So that it could be taken out to be "pitched to potential sponsors", it was decided that the prototype would be accompanied (preceded even) by "The Media Clearinghouse Proposal", a document in business plan format. The adoption of this business genre acted to stabilise the project in its early stages but, like every other step of the innovation did not emerge as seamlessly as its eventual printed form suggests.

Early in the project a meeting between the Dean of Special Projects and the researchers was set up. Having worked with the Researcher for some years on a number of initiatives the Dean was tasked with ordering the process of invention. It

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[61] Launch of Mediascape, version 2, 2006, personal notes.

was at her direction that a 'parallel process' be instituted to develop a business plan and the graphic interface of the portal 'thing'. To do so the researchers would need to define users/audiences, "communities of interest" and "stakeholders". On a whiteboard she detailed principles for a plan through which the researchers could identify and write up a model for their intended site. In theory, by following these steps, the output would be a comprehensive business case that would accompany their research output, a version that could incorporate different audiences. In practice the researchers were horrified by the necessity to perform this unfamiliar genre. They attempted fledgling beginnings but quickly realised that the competencies that they had to attach to such a document were inadequate.

To effect an adequate business case a new human actor was enrolled – a woman whose business was named, indeed, "Word Engineering". Combining the disciplines of journalism and marketing the Word Engineer arrived with new languages to describe the project. From an interview with the researchers at which she took notes directly onto her laptop, a document emerged from her keyboard that constructed a new version of the Clearinghouse using a hybrid of the researchers' words and those of the business case genre.

The Word Engineer conceived of the representation of the concept as 'a dream' that sponsors would "want to know, but as one they would want to conclude, not be told".[62] Almost unrecognisable to its originators, in this version the Clearinghouse as 'product' was defined through its 'vision statement' as an 'IT solution' having a 'value proposition', a 'needs analysis', and an 'investment proposition'.

So began an iterative exchange of documents between three computers as the document was refined. Worked in parallel with the design development and mapping of the Clearinghouse's terrains this circulation of negotiated meanings worked the categories for both sets of inscriptions, the eventual interface and the proposal, simultaneously. Where words effected strategic fits in one construction they were

translated to the other and back again.

Huge variations and reversioning can be traced through the multiple iterations that circulated in hard and soft form as the researchers and the Word Engineer attempted to render the Clearinghouse.

The importance of tables

Also worked back and forth as part of the invention of the proposal was a list of benefits of a range of potentially interested sponsor organisations and users, ('stakeholders' in the genre). Struggling for a solution to render a burgeoning collection of data, the Librarian/researcher took recourse to columns and rows.

Figure 4: Ordering Stakeholders

The instigation of this comparative format to solve the problem of aligning stakeholder organisations to the interests of the project was one of the many critical

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[62] Personal notes from meeting. April 2004

moments where a table provided the way forward.

Not part of the repertoire of collation for the Researcher these tables always seemed like miracles of invention. There were often tense moments when, on trying to map the data at hand into the regulated form of a table there was always some ill fitting category that threatened the solution. Generally this was solved by adding another column, maybe turning the paper sideways to facilitate it, or sellotaping on another page. If the solution was achieving progress it was nothing for the Researcher to scrap the draft and rewrite the whole thing to get the right 'fit'.

Mapping Terrains with Weird Borders

The circular encompassing style denotes the ecological nature of the Researcher's conception of her terrain. In the top left there is a reference to a portal – later to be named New Zealand Online.[63] Clearly visible is the location of the site as a civic space.

In the bottom left we see the research process for this work permeating the research for the Clearinghouse. The Researcher has noted that "everything is leaky, permeable" referring to the slippages and destabilised nature of innovation that Latour describes.

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[63] Coined in informal discussion at the first New Zealand National Digital forum (2002) idea of a ubiquitous digital space for cultural exchange , "New Zealand Online" was an invention travelling a concurrent process of evolution in different but loosely connected worlds to The Media Clearinghouse By 2003 the idea was being discussed implicitly and explicitly as a way to a 'connected New Zealand' (Carnaby, http://ndf.natlib.govt.nz/about/proceedings2003.htm), a "digital NZ users can move between heritage institutions (Phillips, ibid) . By 2004   the concept of a national " intranet" had taken 'New Zealand Online' beyond the boundaries of networked heritage institutions , the total population of New Zealand amounting to no more than a small town in the UK was also being used to further the idea to a variety of audiences. A defining concept for the creation of New Zealand's Digital Strategy was the drafting of a National Content strategy for its National Encyclopaedia, Te Ara. Begun as a neat way to map heritage institutions New Zealand Online had leaked out of the NDF and was cropping up everywhere. At the 2004 LIANZA conference the Chair of the newly created Library and Information Commission (LIAC) – tasked with advising the Minister on matters relating to the sector presented 'New Zealand On-Line' in its most stabilised form to date as : the creation of a new entity that could support 'imagination points' i.e. projects, which could provide the framework for a world-class, digital infrastructure" . By the Fourth National Digital Forum in 2005 the idea had gained the status of a session chaired by the National Librarian and entitled " The Digital Strategy & creating New Zealand On-Line"   (http://ndf.natlib.govt.nz/about/forum2005.htm) though inconsistency of its weight is demonstrated by use of a capital letter for the on line – being at times a noun and at times a verb. (www.liac.org.nz/cms/imagelibrary/100034.ppt+lianza+conference+2004&hl=en&ct=clnk&cd=7)

Figure 5: Mapping Terrains

Working between hand drawn, whiteboard maps and digital representations the researchers and the Word Engineer stabilised a map in words that was a 'good enough' description in business genre. The categories of the site grew a little from this process as the researchers began fledgling attempts to map their terrains in web style orders.
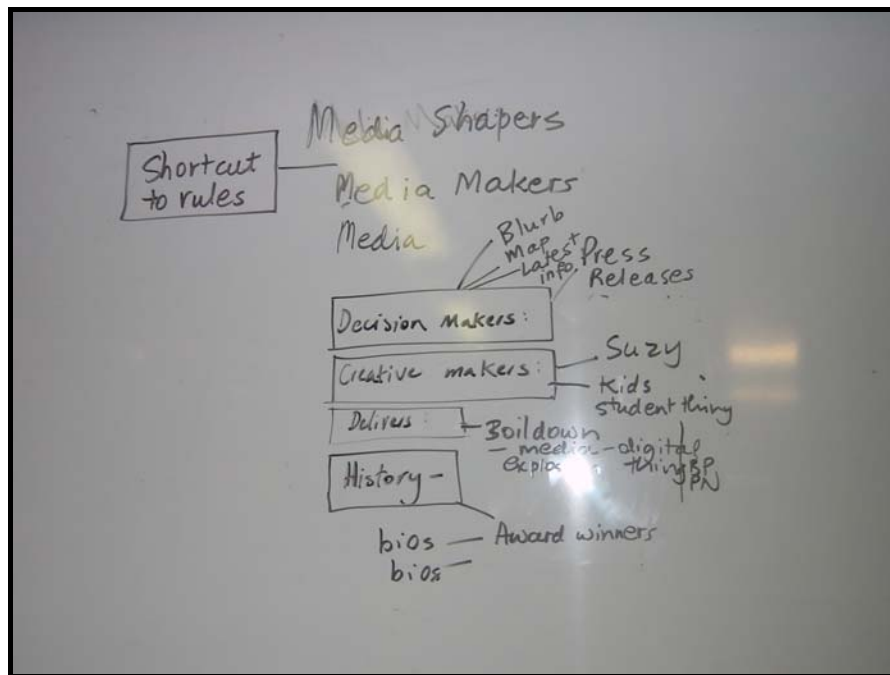
Figure 6: Early Navigation attempt

The syncopated rhythm of poor fits and solutions marked the progress of the work between the two for the intense month of May which saw design elements and navigation architecture emerge from their early mapping attempts and be rendered into a fully integrated 'site'.

The project also expanded its associations to include a new designer. To achieve this, the researchers, having eliminated the idea of sourcing 'talent' from inside CPIT, permission had been given to seek a quote from an independent web designer. A similar scoping exercise as that which found design elements, identified a design style that represented a good fit with the dreamed-of look and feel of the site.

Designing

Early May 2004

Knowing that graphic re-presentation was a discipline which needed to be added to the chain of invention they had explored a list of local web designers' own web sites. Competencies represented in these sites varied hugely. One was markedly more impressive in construction and design elements than the rest. Its inventor

was invited to the laboratory. Each Researcher waited for the Designer's arrival, working at their separate desks in their respective rooms but each had an ear to the window….

The window???...

From : Librarian/researcher Barclay
To: Kate Hindin

We are in TV Block on the corner of Madras and Southwark Street. The building is secure so come down Southwark Street till you see the bike stand. Tap on the window above it (Ruth's Office) or knock hard on the door to the left of it. We will come and swipe you in.

Whacky I know! See you then.

We have a brief of sorts, an architecture and a vision of what we want. We particularly like your navigations example as having relevance for the way we want to unpack our content. …

Important thing is it is a pilot. We need it up asap and will need to give the flavour, integrity and intent which will communicate to stakeholders. All detail will come later.

Look forward to meeting you

Style Mining

Effective performance of web architecture depends on the continual production of the site at the creators' end, on the multiple mediators in the form of servers and platforms through which it is translated to the user and the settings and configuration of the end machine that will further determine the look and feel. These 'standards' must be folded into the original design, yet in many cases they move so fast that redundancy occurs before the invention leaves the 'lab'.

Folding and ordering knowledge for the prototype into fixed points on a web navigation required the acquisition of significantly different disciplines than either had worked previously. For the Librarian/researcher, used to some standardised taxonomies that could prescribe order, beginning from a blank 'page' represented a daunting challenge. For the Researcher it was difficult to grasp that ordering information conforming to some sets of standardisation could not be endlessly edited as a document, might be, right up until and even sometimes beyond the point of 'publication' .

Minutes of a meeting in early May read:

"2. … Survey what exists and raid it for a) content b) layout. "…..

Not quite knowing how to begin but required to give the designer some kind of brief, the researchers decide to mine the web terrains they did know. Sitting side by side, hunched over the computer in the library, they visit existing web sites to assess them for design elements. They timetable web search sessions where they trace through the terrain: regulators, educators, researchers, media makers – classifications that would find their way into the ordered categories of the eventual navigation for the site. This 'mining' process refined what they knew and was the beginning of the collecting and collating and locating of their common knowledges. Performing as users, the researchers travel the terrains and representations of their worlds on the web. Each front page and sometimes internal pages of sites researched is printed.

Singular, electronic storage is defeated by personalised log ins meaning each could not access the other's search record. Nevertheless, familiar and newly-discovered digital pages are all 'bookmarked' under roughly devised categories. These are then printed on to paper, and collected on a table in the library. This translation into hard copy is far from seamless. Ruptures occur at every turn.

Printing is a syncopated process. The printer is in another building. Because of security for audio visual equipment, the building has swipe card access. So, to get a resultant pile of prints from a research session required finding the swipe card (invariably mislaid) walking two minutes across a car park, and upstairs to the school's main office. Retrieving prints requires sorting theirs out from any

others which have been produced by other users of the centralised printer flow and then retracing steps back to the laboratory. Invariably they discover that they have forgotten to set the print setup to landscape to accommodate for web screen sizing and as a result some crucial element has been omitted. Often printing simply goes astray somewhere along the networked pathway. Printing is picked up only when one of the researchers is in the other building for another reason. The loss rate is high. Later bookmarks of precious collected sites are lost when profiles were routinely re- imaged.

Why weren't the researchers saving screen shots, archiving sites or utilising other web capture techniques? A mix of impediments was at work.

Web archiving was a relatively new concept. Requests for direction of the best way to capture sites had been unsatisfactorily answered from librarians and IT staff. A referral to a librarian at another institution with a special interest in intellectual property offered a little clarification, enough to proceed without fear of wrongdoing.

But, even assuming successful capture, how would these objects be kept and effectively retrieved. No clear order had yet been ascertained, no hierarchy of classifications, beyond academic resonance or graphic preferences had been established. The pages were just printed and piled up on orders which related to the relationships between their sources.
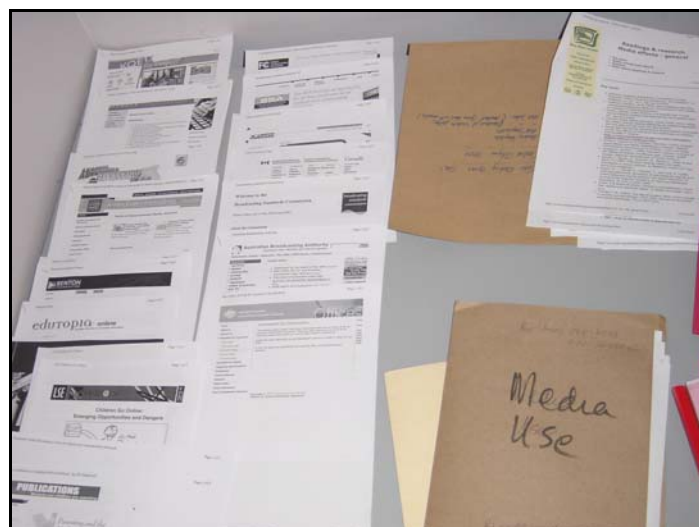
Figure 7: Style mining printouts

Eventually the researchers perceived that some sort of critical mass had been reached, and sorting began. Although a number of commonalities had emerged from the sites the researchers were acutely aware that there seemed to be few rules in the web world into which they had ventured. So they simply continued to follow their aesthetic noses and made visual value judgments where academic or informational ones did not suffice.

At this juncture, one particular board (Fig 8) became a key participant in the design process. It displays another table, this time devised to compare and contrast design elements selected from the scanned sites.

Figure 8: A table to compare style elements.

The rows denote the agency whose site was analysed. The columns, features identified as desirable, workable or functional. With absolutely no formal knowledge

of usability as a discipline the researchers were literally following their noses towards stabilising a set of characteristics which endured, largely intact, throughout the creation of the prototype. All design compromises came to be measured against the key features which can be seen below as ticked squares outlined in red. Squares crossed and outlined in blue denoted truly detested features, to be avoided at all costs.

This whiteboard performed a little like the pedocomparator that Latour's scientist used to compare transport soil samples. Seemingly independent design features, once located within the experimental confines of the researchers' whiteboard laboratory were rendered commensurable, revealing patterns of preference from which they would draw predictable and enduring conclusions on which to craft their navigational mapping categories.

Navigating Categories: What is a web site anyway?

Behind the seamless presentation of 'double click' logic on a web interface navigation is likely to be a chain of translation that weaves a convoluted pathway through every nook and cranny of the domain's layers. Web building and design requires the collaboration of designers, technicians, and programming knowledges and all their associated technologies.[64] Those people who bring to the project the knowledge of the terrain to be mapped are only some of the deciders who structure what the interface will present, re-present, about a world. Other actors that will have a significant 'say 'in how the job gets done are the multiple layers of coded signifiers and their connected technical specifications. Unlike a stable classification that orders worlds according to pre-agreed standards, for example a library that classifies by subject matter or author, or a medical information database that classifies by disease or patient name[65], web orders are flexible and generally specific to each design. 'Rules' of web design are not inscribed but circulate as loose guidelines for adoption or

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[64] See (Damarin, 2006, p.441) for a good description of the categories of responsibility for web work.
[65] See (Bowker & Star, 2000)and (Girard & Stark, 2003) for a detailed description of these worlds.

reinvention around the interests of the users.[66]

It is thus perhaps not appropriate to describe web site work as 'black boxing'. Certainly, a web site is partially 'black boxed' in that look and feel, consistency and navigation tend to be stabilised. However, compared to say, a published book, the order of a website has a high degree of mobility. Web design is more like music – written once– performed often and with many different versions[67]. Seen and unseen, fixed and mutable, meanings and associations must be given consideration. Success is measured by how well and how long the stabilised classification can be *used.* The task is to make accessible as many of the objects embedded in a site as possible to as many users as possible and across as many overlapping categories as possible. Unlike a static exhibit 'site', a web 'site does not need to subsume bits of the terrain by the rubrics under which they are organized (Meadow & Robertson, 1999)but can hyperlink them across and between, rendering them 'discoverable'. The challenge is to capture and name the gross links which connect the subject domains and to render the associated meanings attached to them transportable over as many formats as possible. Somewhat ironically, those hybridised objects, those whose boundaries touch many borders, can cause the most trouble.

Although web infrastructures afford more flexibility than a printed text, at some point an agreed set of top labels must be established, down from which the infrastructure of the site can be "hung". The top navigation is something of a boundary object for the domains of the site – collecting and ordering a range of worlds within the site and around which the varying yet associated worlds of each section can be ordered. If this top order shifts, all the associated orders must inevitably be reworked.

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[66] For example, the "three click rule" which suggests that it is 'preferable' for information to be retrieved in no more than 'three clicks'. The 3 click rule, at the very least, ensures you are always thinking about the website navigation system, but apply it in the following way: "Don't put important information on your site that is more than 3 clicks away from an entrance page". This way you'll ensure visitors see the important content on your website before they leave. http://www.accessibility101.org.uk/tips/31.htm

[67] Interestingly, this is a metaphor Becker chooses to discuss methodological conventions (Becker & Pessin, 2006, p.281)

Defining the multiple categories of the domain represented the biggest challenge for the designer/researchers. Words such as architecture and structure that have been adopted by the language of web design to describe this topographic ordering of a site's interests derived from a long tradition of classification but fitted uncomfortably in practice for the researchers.

Mapping terrains of interest for web interfaces is not a skill that either of the researchers had acquired on their travels through worlds of academia, advocacy or library service provision.

Classification as a work in the worlds of web builders (rather than as a stabilised discipline as for more bureaucratically ordered worlds) works to build related hierarchies that can be discovered intuitively.[68] Whether the user is a human using a mouse to "click" from the top navigation down through the sub-navigation layers of a site, or a web crawler fetching and indexing page tags and metadata, both work within the localised environment of the site that has its own architecture. While rules, standards and protocols, for technical delivery of the image to the page apply, the signs which that image delivers in terms of words and categories is of little concern outside that local 'site'

Web designers who are proficient with digital ordering tools such as spreadsheets tend to work navigations numerically following a decimal structure similar to that of clauses in legal or other highly ordered documents. Top navigation headings are singularly numbered - 1. Their 'sub-navigational elements' are attached via decimal point – 1.1, 'sub-sub-navigation' elements by two decimal points- 1.1.1 and so on.

A section of the navigation of the prototype would have looked as follows:

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[68] Navigation in words has been assumed as the norm. The MC was intended to promote media literacy. Much debated is where this "literacy" bounds other "literacies (visual, numeric etc.) Although I have seen work on iconographic content I have not seen any research on the validity of iconographic navigation. This would be a worthy topic for exploration.

1 Media Life

1.1 Your Parenting Style

1.2 Growing with media

1.3 Early Childhood

1.4 Young teen

1.5 Issues

1.5.1News

1.5.2Violence

1.5.3One Boy's War

1.5.4Obesity

2.Media Messages

This method fixes each clause or, in the case of web design, page, clearly in a relational order to all other pages in the site. The MC web designers were unable to perform with such proficiency. Numbers would not align to content in their world, though valiant attempts were made to do so in spreadsheets that were worked and exchanged in emails between them and the web designer. Categories refused to be stabilised in any order. Numbers refused to remain associated with relevant content headings, top categories refused to give way to branches below them and needed to be moved, whole numbering structures fell apart.

Rather than resistance, as some analysis might conclude, this lack of compliance to the normative expectation of web design convention was simply an inability to integrate the discipline of numeric ordering into the discipline of social research methods. Since neither Researcher would have listed mathematical logic as a strength nor would have given weight to such a skill, mapping in their world seemed to require a more concrete solution, one which could render labels mobile enough to manipulate the ordering without the whole 'thing' breaking. post-its provided the work-around. On the end of a filing cabinet the Librarian/researcher experimented with a few headings (Fig. 9).

Instead of the constrained space of a digital spreadsheet, dictated by a language of manipulation that required knowledge of spreadsheets, cells and equations, post-its on

a filing cabinet, and later transported and translated onto whiteboards, offered relatively limitless possible combinations. Colour felts denoted possible link orders and each post-it bore a single label. The adhesive offered the opportunity to 'hold' the order but also to re-order almost indefinitely.
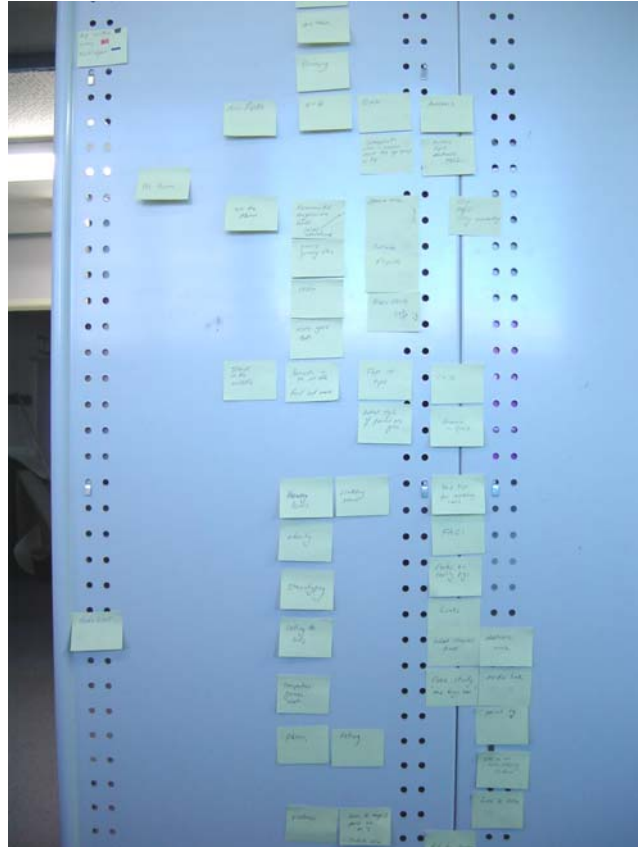
Figure 9: Post-its - immutable mobiles

Thus the weight of the classification was able to shift to the words written on the yellow squares and not to the numerical structure. For these hybrid research/designers the relational structures of association became a concrete one of literally positioning post-its adjacent, above or below rather than understanding the relation in terms of decimal points of segregation.

Dreaming data – co-constructing 'pilots'

Across the road from the Researcher's laboratory, a separate but intersecting timeline

was being worked by a team of librarians hoping to enrol a piece of software that could also make maps.

Mapping of data, and specifically data about data – metadata- was an increasingly debated area of innovation in library and information worlds. The need for standardised means to connect dispersed databases called increasingly for means to collect, associate and deliver common elements to remote desktops. One way this was being proposed at CPIT was to render searchable the institution's collections of objects created in the various teaching schools; objects as widely variant as bread recipes from the Baking Courses, sculpture from Art and Design and performances and scores from the Jazz school. By creating a database of standard data about each object which was held in the uniquely separate databases of each school a comprehensive and sharable repository would be created. The proposal included the of purchase a software product, ENCompass[69], which would store data and, connected via the library catalogue, would act like a gateway to the collections.

Being trialled by another innovative project at the National Library of New Zealand, Matapihi (the window) the interest in ENCompass attached the library, and through it the Clearinghouse project to the much bigger world of information and knowledge innovation that was struggling to work standardised, global solutions for connecting local and specific collections of objects. The Matapihi project was further down the chain of invention than either of CPIT's pilots. Its aims were to seamlessly link multiple, distributed digitised collections at participating galleries and museums to be searched from one centralised web site[70]. Key to this form of delivery is that only the metadata is stored centrally.

When users search the metadata repository, the Matapihi search results contain a thumbnail for each retrieved item, along with the title and the name of the partner

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[69] The Ei EnCompass D atabases are part of the product renge of the online publisher Elsevier.
http://www.elsevier.com/wps/find/bibliographicdatabasedescription.cws_home/703038/description#description
[70] Then in the process of invention Matapihi (www.matapihi) was launched in September 2004

organisation. Users click on the thumbnail to open a new window containing the partner's website with the full version of the item and further information.[71]

An assemblage of two actors that were very important to the successful linkages in the Matapihi project the XML metadata language and the schema or standard that it sometimes structures, Dublin Core. In the form of localised guidelines for use, still in their draft form and so semi-embargoed, the Matapihi Metadata Guidelines were sent to the Librarian/ Researcher as a place to start classification of objects that were to be stored in the Clearinghouse repository.
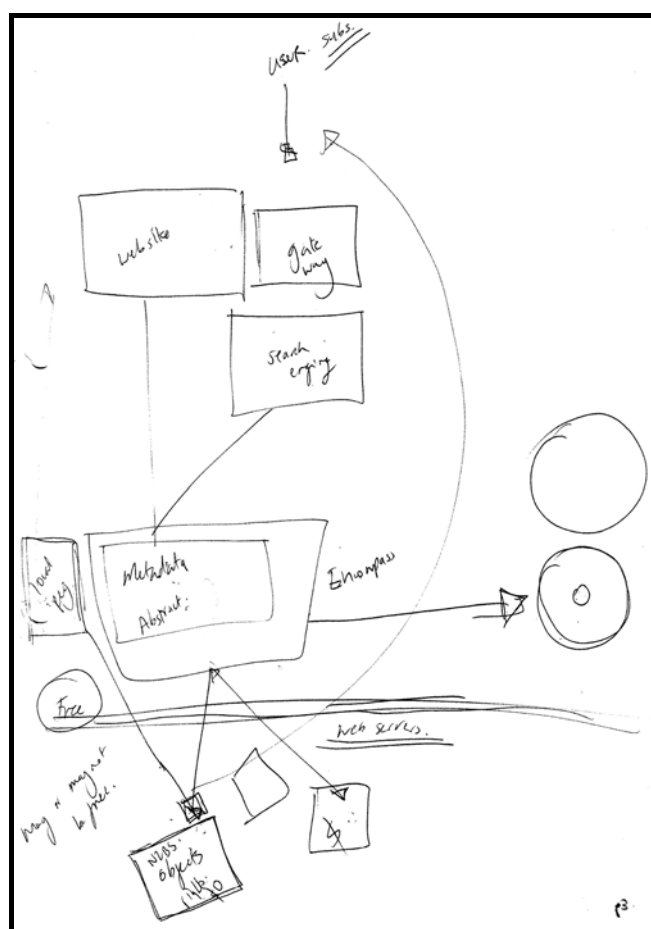
Figure 10: Metadata sketch

How this metadata assemblage would connect across servers and between software

[71] http://ndf.natlib.govt.nz/about/matapihi.htm#othersites

applications required repeated clarification for the researchers. A common understanding was eventually effected through one detailed drawing (Fig10) that 'sited each actor and its connection. This drawing travelled and was replicated several times as the intended use of ENCompass hybrid was stabilised further.

The ENCompass Pilot and the Clearinghouse were associated by inclusion in each others plans. The co-creation of these associations gained considerable weight. ENCompass was installed on the Clearinghouse computer, forging links across the network and making the association stronger, so that the Researcher /Librarian could learn the programme. Meetings between the most senior librarians and collection managers for the library, network managers for the IT departments and the researchers, debated how the pilots would fund 'scattered' servers which could together aggregate enough capability to store their collective burgeoning potentials of data.

Seemingly then, the collaborative efforts of the hybrid ENCompass/ Dublin Core softwares had been stabilised to perform as infrastructures for the Clearinghouse content. The ENCompass literature used the metaphor of boxes, depicted as structurally organised containers into which the data about data would be put. Its diagram resided on the laboratory wall beside one carefully transcribed from a whiteboard sketch of the first concept for the Clearinghouse. (Fig11) This notion of objects in containers resonated widely with references circulating through library and information worlds regarding the co-ordination and federation of national digitized archives. Since the Broadcasting School held a number of collections worthy of archival status the ideas of developing the Clearinghouse infrastructures to incorporate these gained weight beyond the initially proposed concept.
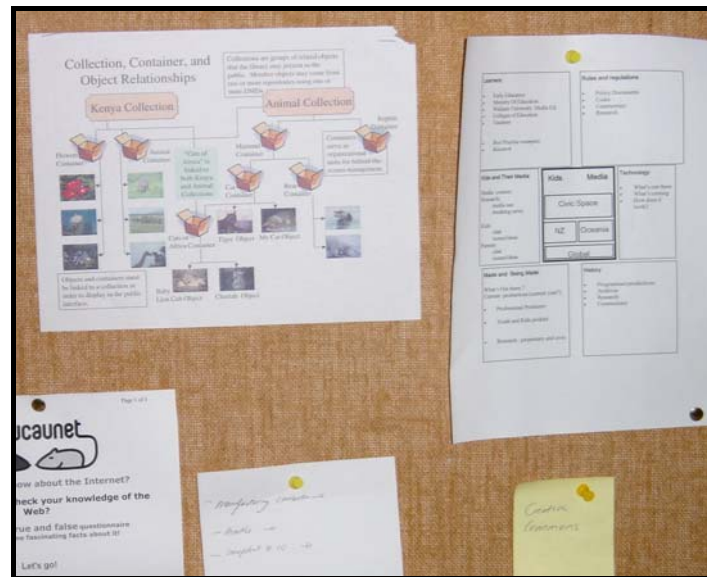
Figure 11: Encompass training diagram and Clearinghouse sketch

Yet, just when it seemed the ENCompass project had been translated into enough different disciplines and had attached sufficient weight to carry the objects intended for its containers, new information emerged that disrupted the flow of development for both pilots.

Mid May 2004

The Librarian/researcher meets with the CPIT Digital Library Manager and the Library Network manager in a small office in the library administration building. On a low table is a three sided, flatish cone of black plastic with patterns of holes, buttons and lights on its three sides. The 'webex polyphone' connects to the phone cables through which the librarians will 'hook up' to a representative of the ENCompass parent company and allows everyone in the room to participate in the audio link. On the computer monitor on the desk, a link to the reps' computer in Chicago will allow her to take over the cursor and demonstrate the product when the phone link is made. The meeting's start is heralded by the Technical Librarian at the desk exclaiming" I've lost control of my mouse!" The lights on the webex flash green. Two computers, phones, and humans are connected.

Tension emerges from this discussion that extends beyond the control of the computer mouse from Chicago. It emerges that the product may not deliver the full range of competencies anticipated. Crucially there is no authority control for

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subject classification. In this version anyway... It is due in a planned update but its release is not imminent. For librarians used to managing data by controlled vocabularies this is a significant setback. The ENCompass pilot has been predicated on the selection by each school of an appropriate standardised vocabulary which would facilitate transformation of its data into the common XML datasets. No control meant no standard could be built....

From this small office in the Southern Hemisphere a thread is stretched across the globe to which is attached a plea for hastening this authority functionality. Its chain will not be pursued here except to say that the trajectories of these librarians and their digital dreams, The ENCompass Pilot project and the Clearinghouse Project, took increasingly divergent paths. The Media Clearinghouse project maintained its attachment to the idea of XML metadata but allowed that attachment to be increasingly weak in relation to the ENCompass pilot project until such time as the two might be reconnected in, as yet, unforeseen associations. Each having different temporal structures the building of the prototype as a demonstration piece had to proceed.

Embedded in the completed prototype, as we will see in the next chapter, the worth of centralised metadata recovery was demonstrated in a mock ENCompass derived interface to signify that the relevance of XML as ubiquitous communicator of content was securely attached to the project. This steadfast positioning of the project in relation to digital initiatives being worked at sites with much wider networks than the Clearinghouse was part of the chain that extended from the Librarian/researcher's attendance at a conference the year before and would ultimately see the Researchers making submission to the emergent government digital strategies of coming years. It would eventually be translated along some forward chains of translation of the project to the use of an XML based, open source content management system for the realisation of the full Clearinghouse site.

In the meantime though, for want of a database to attach their collection to, the researchers had to create something with the look and feel of a real site. They consulted their designer, to whom the XML hybrid had always been something of a

stranger, and devised a new list that would order their way forward.

Designing Top down

Figure 12: Considering the first homepage mock-up.

Work began in earnest on the design of the graphic interface. The designer had produced a mock-up, based on the rough navigation categories provided by the researchers and their summary of the graphic elements produced by their mining of other sites. Working back and forth between the elements identified from the 'mined' styles the mapped categories and the design and standards compliance considerations asserted by the Designer, a 'home page' design emerged. This was a tortuously iterative process that saw multiple versions trialed, stabilised and agreed, only to be disrupted by the realisation that some design element would not allow other necessary features to flow down into the informational layers of the site.[72]

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[72] After the prototype successfully attracted sponsorship work began on the navigational infrastructure

In this way the two disciplines accommodated each other. However, a major problem in attempts to configure the order of the navigation emerged that disrupted a satisfactory workflow for some weeks.
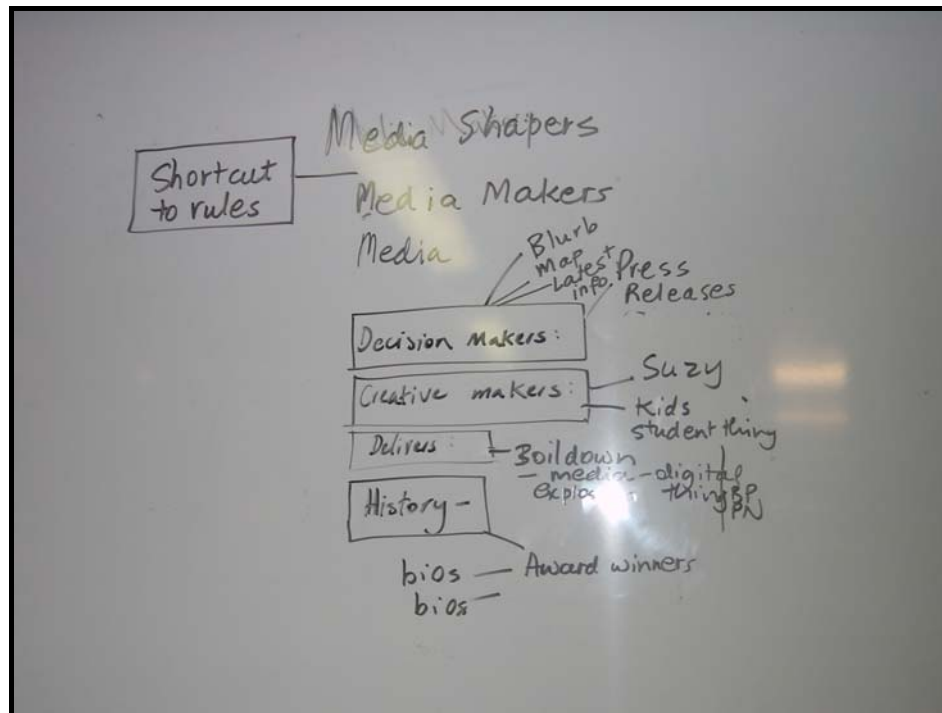
Figure 13: Whiteboard sketch of a version of the navigation

For the designers, the navigation categories of the site still refused to stabilise.

From the inception of the project the researchers worked with a high level of reflexivity as they struggled to represent the multiple and heterogeneous connections of their terrains. For one of the researchers the complex task of building the site, mapping of knowledges 'in order' to render an effective web navigation structure, was describable as being like solving a puzzle of Russian Dolls. One territory of content inevitable fitted inside another. The difficulty of ordering was in deciding which should be placed highest in the navigation.

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for the 'real' site'. A third discipline, that of programmers was added to this assemblage. Work flowed between these three disciplines only once it was discovered that the Designer and Researchers were

The task required stabilising a series of top categories[73], working back and forth between the mass of knowledges and domains of operation. Since 'Regulatory' operated differently and through different chains of translation and inscription to that 'self regulatory', production and distribution for film and television performs very differently from that for free to air news and current affairs as does the associated regulatory constraints for each, performances often overlapped. By raising one category up the ranking, others lost their places in the hierarchy. The task was to make categories that had associations with as many aspects of the domain being mapped as possible so that the content could be layered in multiple connections down and across the site without erasing or diminishing other content.

By now the end of the filing cabinet became an inadequate actor for this constant reassembling. After much debate and referential arranging the top headings had largely been stabilised. The site would be divided into four domains: Media Life, Media Messages, Codes and Regulations and Media Research. Some of the work of devising lists of pages and page content had begun to be done in Word Documents. These were hybridised solutions to some re-attempt at numbering the site but were still too fixed in format to meet the flexible needs of the researchers who were ever reassessing and re-shuffling their terrains.

Design ideas continued to be evolved with the designer but this process reached a stalemate of sorts. Until the nature of the content was settled, and the designer had a good idea of what was to be hung from the navigation it was difficult for her to stabilise the brief into stable design elements. What was required was a massive push to get the thing settled.

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mapping the terrains 'top down' whilst programmers code 'bottom up'.

[73] In the second phase of the work, once the prototype had enrolled support and programmers were enlisted the researchers discovered that this set of disciplinary competencies worked bottom up to build the coding for navigational structures. This fascinating duality is worthy of further observation.

"Big Sunday"

The researchers had been struggling to find time to meet over the navigation for some time as they were now working 'bottom up' on content .To complicate matters, the Researcher was also designing a course, due to begin in July, and which necessitated much collaboration with other teaching staff and the booking of a raft of guest speakers. The timetable for this task had recaptured even the mobile whiteboard and this had further compromised work on the site.

It was decided to migrate the work to an adjacent office and to set aside a Sunday to work, uninterrupted on the project. In preparation the post-its were transported on fingertips and dotted on the fixed whiteboard. Word document were printed and stacked. Pens pencils and markers were readied (Fig15).

'Big Sunday' transformed this odd array of ingredients into what may be one of the most unique workarounds in web design history. By the end of the day an extensive assemblage of post-its, literally cut and pasted word documents and whiteboard marker inscriptions had been ordered and associated into an inelegant but highly performative web site navigation structure with associated design sketches.

Figure 14: Cutting and pasting
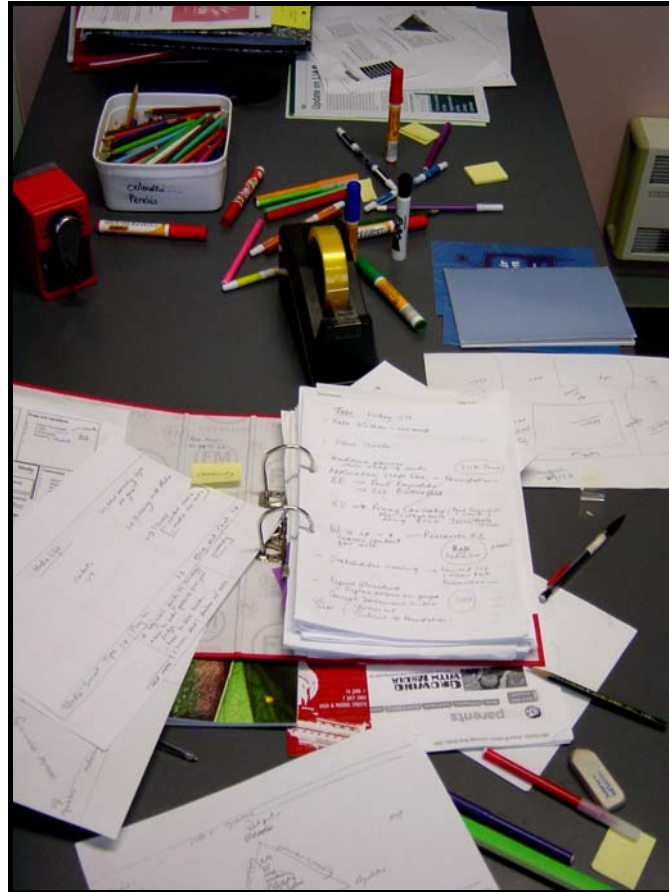
Figure 15: Tools for mapping

Although relatively impossible to interpret by anyone other than researchers themselves Fig 16 shows the finally stabilised map that the researches had been striving for. Its bounded, four domain, structure with layers of sub-navigation that bored down to detail also allowed movement across the media worlds re-presented so that each could be supported by regulatory and research content.

Figure 16: Hybrid workarounds

.From this quirky assemblage, building the site navigation architecture was a matter of numbering the concretely ordered elements, then translating each number and its associated content heading into a neatly inscribed version on sheets of sequentially ordered paper, for delivery to the designer. Returned via email transformed into an excel spreadsheet (a miraculous translation for our computationally challenged researchers) the now stable order of the site could proceed to be wrapped and layered with graphic elements. The excel spreadsheet went on to have a very long chain of translations which went all the way to the launch of the eventual site and, perhaps beyond it. Those labels changed multiple times on this journey, even those of the top categories, though the basic structure of the four main domains remained the same until a new version of the site was launched in 2007.

As for the post-its, they had not yet completed their chain of translation. After being recorded for the navigation coding, each small yellow paper was carefully removed from the board and pasted onto a piece of paper. These pages were then reassembled as a pile beside the Researcher's desk. There they systematically ordered the writing of content for each section of the site, the corresponding post-it being crossed out

when content was approved and filed on the drive shared and accessible by both researchers.

The work, now stable enough in its categorised form and various ordering systems, flowed. Knowledges could be translated into the pre-determined locations as text, as coded relational 'pages' that expanded the 'logical tree' of the site.

What remained to be done to 'complete' the prototype was the crafting of the interface, for which a whole new set of orders and inventions evolved that attached different genres of representation to the architecture. How the details of the navigational map was translated onto the graphic interface is a tale for another piece of work. However, one final vignette relates the minutiae that the work of circulating the designs entailed.

A new fangled device

Moving the now multiple versions of navigations and design drafts of text and images between researchers and Designer became an increasingly complex task. The
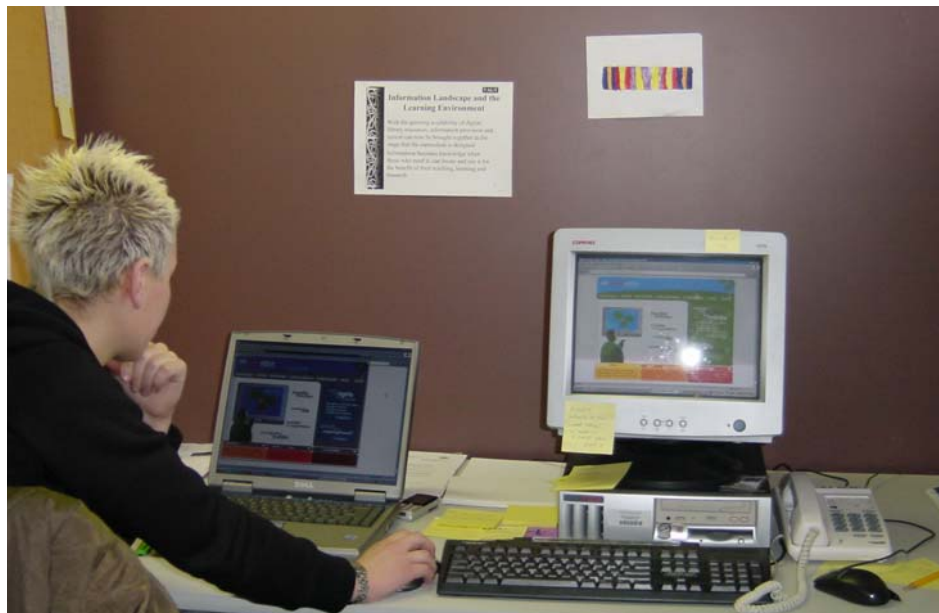
Figure 17:Technologies refuse to assemble.

researchers and their computers were located 'inside' the network of CPIT's information technologies. Files were freely able to travel between them. The Designer, being an independent contractor, worked both physically and technically 'outside' the network.

There were a limited number of ways for new versions of the 'site' to travel and become available and shareable for further design iterations. The designer's laptop travelled easily but its cumbersome and inadequate batteries were forever breaking the sets of associations needed to power it. Some pieces of design could be emailed between CPIT and the designer's own ICT networks. However, to be 'read' by the researcher's machines they required software not enabled at their 'end.'

June 2004

The Designer arrived with a 'new' technology which had the potential to make these chains of association flow far more efficiently. From the pocket of her jeans she pulled a small plastic rectangular thing, smaller than a cigarette lighter. Its cap pulled off to reveal a metal, rectangular plug.
"Where is your USB?" asked the Designer
The researchers exchanged inquiring glances… and shrugged their shoulders.
 The designer perused the front of the Researcher's Hard drive.
"Hmmm, must be at the back. Is it ok if I turn it around?"
"So what is it you are looking for?" inquired the Researcher.
" Your USB Port" was the designer's muffled reply from the back of the machine.
"Ah, found it! …. Oh no, it doesn't fit. The casing stops the connection"
Restoring the Researcher's workstation they went next door to try the Librarian /researcher's computer.
"Mine is older, I doubt I have one"
Her suggestion was confirmed. This 'new fangled' thing, (data stick, pen or flash drive) which would eventually become so ubiquitous that they would appear as jewellery, as give-aways at conferences and would be carried around by school children, lay, for now, impotent on the library desk.

Multiple other solutions were tried. Technologies which each embodied various competencies were assembled. The designer's laptop and hard drives had the potential

to be connected by cables but the ports on the CPIT hard drives were not configured to allow data to travel between them. None effected an adequate workaround. Phones with 'blue tooth' could exchange the data but were not permitted to upload it to the network.

Once the prototype succeeded in stabilising funding and was located along the chain of 'Special Projects' within CPIT, the designer was allocated a password, which enabled all files to be uploaded to the project's newly created shared drive on the network. Ironically, by then, new hard drives came configured with USB ports, easily accessible and compatible to all portable drives.

In the next chapter, three vignettes tell moments in the story of the site's passage beyond its 'laboratory'

7. 'Completion' the prototype leaves the laboratory

Figure 18: Prototype Home Page

The nature of a prototype is that it requires attachment before it can become robust enough to become a real thing. At the point of 'completion' it is a real/unreal thing – mobile enough to be proffered for consideration, presented and spoken to in demonstration but static in terms of moving on or through the 'real' www.

The project met its completion target of early July 2007. In form and structure it could have been launched as a 'live' website. The navigation and "back end" functionality which presented a 'click and find' map of the sites embedded content was fully operative as was the possibility to populate pages with content. Its content however was a cunning mix of real and invented texts, designed specifically to enrol targeted stakeholders[74]. Both content and information infrastructures were partial, fragile and

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[74] "Stakeholders", being those with interests or those who stand to gain from a project, is a highly contested term. It is used here because that is the term used throughout the design process, especially when the proposal for the project was being couched as a business plan. However, the questionable use

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highly variable and like Latour's Aramis, yet the connections from the project went "all the way to the minister" .

Burnt to multiple CDs, at the time the most compact form to store the site in stable yet mobile form, the prototype began to travel on a demonstration circuit intended to enrol support for a fully actualised version of the concept. One travelled to Wellington and was projected on screens at a forum, in a meeting room at The Ministry of Culture and Heritage and in the Board room of the Broadcasting Standards Authority. A third made its way to Auckland and was projected onto a screen in the boardroom of the Radio Broadcasters' Association to a meeting of the Advertising Standards Authority Board. Each of these re-presentations, and one given directly from the CPIT servers in a teaching room re-configured for a presentation to the Families Commission, was subtly varied, minutely reordered to meet the interests of each potential sponsor.

Performing the prototype required its human inventors to reconfigure their actions and their actors again. Selling the idea rather than describing it, did not rest comfortably with either of them. Airline timetables, taxis, laptops, cables, connections and back up plans for failure of any of these became added to the chain of invention. Something new is vulnerable until it is adopted and supported, inscribed and documented. The prototype was circulated through a variable array of hybrid performances. The 'site', the digital version of the concept tended to be reproduced via laptops which read the data from CD-rom and translated it via digital projectors onto big screens. A myriad of enablers were required before the site would reliably display directly from an internet port at the site of demonstration. By ensuring control of each translation the presenters could be sure that the concept would display in its complete and correctly configured guise. At these presentations the digital image was always accompanied by a document, the most recent iteration of the inscriptions that supported the 'case' for the project.

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of it as necessarily limited to business and investment models and thus not acknowledging a breadth of interests is acknowledged

The site had also been relocated to the CPIT server but could only be accessed via a password. This hybrid solution, a work around the need that the CPIT network enabled permitted access only to its servers[75] and was a way to both protect the intellectual property of the concept and to clearly signal the site was 'not real'. The site had not yet been rendered 'discoverable' but, in the event that it is uncovered by the algorithms of a search engine's discovery work, a front page that described the project, invited interest and offered the opportunity for the user to apply for a password to enter and view the prototype.

This password became a key actor in the movement of the site form the laboratory to circulate in an iterative fashion. The password was 'greentree' combing the programmer's habit of using a colour and an object "out the window" to make each password and the cabbage tree motif that located the site in New Zealand/Aoteoroa. An unexpected outcome was that the login data, recorded and reported by the server for each use of the password to access the site, made visible to the researchers which agencies were accessing the site and whether it had been passed to any other users not directly provided the password by the users. This was not a reliable measure of interest however since the circulations of the multiple copies of the CDs could not be traced.

The travels of one such encoded plastic disc, presented to the Minister of Broadcasting, was of particular interest – though its final resting place was never known, that Minister, was later re-associated with the concept when he presented the realised site at its parliamentary launch.

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[75] In fact this was not quite the case. As the project grew and gained workable associations with government agencies and financial sponsors and in association with a new webmaster a workable set of protocols were enabled meant the site to be hosted with open public access.

Two tales of performing the prototype

Second Semester 2004

The Minister of Broadcasting has come to talk to the students who are enrolled to learn the skills of media production. In the darkened TV studio that is acting as lecture theatre that semester, he presents a PowerPoint on the Government's vision for broadcasting futures and public service television. The 'picture' of 'broad–casting' is shifting as ubiquitous transmission to passive audiences is being augmented in media consumption worlds by 'just in time', personalised access to multiple contents, formats and platforms.

The Minister commands a persuasive blend of statesmanship with the intimacy of the teacher he once was. He shares, "in confidence", with the students and their attendant lecturers, some likely inclusions in an upcoming report. Such small snippets of direction are the stuff of political maneuvering on which a myriad of alignments between the school and the policy makers are worked. There is nothing unplanned in his speech, though he makes it appealing to think so.

Half an hour of his diaried visit, inscribed on the sheet carried by his aide, whose job it is to mind the time and the audience, has been allocated to two researchers at the school briefing the Minister on a project, a prototype for an information Clearinghouse. Gaining his support, endorsement, acknowledgement would start chains of association that could mean the money was enrolled to make the prototype real. "The Minister" is an assemblage of institutional lineage. Bureaucratic associations link the embodied portfolios of Broadcasting, Education and Community Affairs. Later this hybrid shifts and is reassembled around men and women, making the work of enrolment very different but for now, the collection has a tantalising weight for the purpose of the project.

 The buildings that house the school are an odd assortment of styles, an assemblage of linked temporary shelters housing a raft of screens and their associated technologies. Minister, senior teachers and researchers decamp along corridors, through security doors, across the car park, up a staircase to the school office and beyond to a seminar room.   It is an uncomfortable procession and many agendas float, unspoken, having no place in a car park.

Once in the room, the minister moves to the far side of the light oak table, which, because of the makeshift, hobbled nature of the buildings means he has to stoop below the acute angle of the roof on that side. The expectation of the researchers was that the Minister would be distracted, busy with 'bigger' concerns, but he is surprisingly focused and ready to hear the presentation. On the table a folder containing a printed paper document "*The Media Clearinghouse: a proposal*", a CD Rom and a series of coloured screen shots. With only minutes to spare the folder was requisitioned from the marketing department so as to comply with, until then unassociated, institutional mandates for public presentations on behalf of the Institution.

After prepared speeches are delivered and informal discussion is exchanged, the assemblage of inscriptions that is the prototype leaves, in the hand of the aide, to the waiting taxi. The dream begins its passage out of the laboratory.

Digital Forums

November 2004

In the auditorium of the nation's museum are a mix of archivists, librarians and bureaucrats, collected to debate how to shape the digital futures of the national collections. An idea is circulating – New Zealand Online – a concept that has gained weight since first floated as a throwaway line at this forum two years back. As the story goes Jock Phillips, historian and translator of frontier myths, coined the idea of a contestable pot for digital projects and a means to connect the digitised archival memories of the nation. The idea has grown, gained weight and been expanded beyond its archival utility. At this forum it appears at a session where projects that might fit its brief are presented. The Clearinghouse is one of them.

Those who are presenting sit on the black curtained stage at a table draped in black. They have to crane their neck to see the big screen so as to connect visually to the other projects with which they share this link to a concept. The CDrom on which the final prototype has been burned is inserted into the disc drive. On the podium side table there are a stack of laptops piled one on top of the other. Somehow, although this is a digital forum, things are not very digitally

seamless. One of the keynotes had planned to present his talk via wireless connection to his server in Auckland but the theatre is a black hole of connectivity. He does it off the cuff.

There is a "techie" who hovers, brings the appropriate images to the big screen by pushing the keys, and knows what is plugged into what. The microphone is too high for presenter to speak into at the same time as reaching for the mouse to move and point and change the pages through the presentation.

It is a brief overview that is presented – words carefully chosen to distil and articulate the vision. The home page – each detail carefully illuminating some aspect of the overall scheme shines out into the darkness. Next on the screen shines a page of fiction, a mocked up version of a database management tool, Encompass, that communicates to this audience – "this is more than a website." Close reading displays a number of dreams folded into a hybrid fantasy of seamless digital connectivity and delivery of objects from a range of real and imagined repositories.

Figure 19: Imagined Metadata Worlds

The feedback over cups of tea is good. The site is taken seriously. The concept has gained a few more links in the chain towards reality. Too much so – some do not realise that this is a *prototype*, its links do not necessarily connect.

At this forum of curators, archivists and librarians, the project is claimed by differentiated actants, who, like Grinnell's collectors and curators, each answer to a different set of audiences. The National Librarian wants to archive it "as is," an exemplar of where broadcasting is in 2004. Others compare their launched and active sites as "not being as professional" as the Clearinghouse.

"No, it is not live yet!…. No, it is a rendering, still a dream, a fiction. We need money to make it real and that is what the presentation was about. This is what we *could* do. It is a sketch, a pastiche, a mirage"

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Somehow the Clearinghouse has taken on monstrous proportion – become heavy beyond its internal frameworks. Perhaps stabilised so well, yet not sufficiently attached to sustainable support, that it will quickly sink to the bottom of the ocean of potential projects?

Section 3: Reflections

8. Conclusion

Can there be a conclusion to a work of description?. Not if what is meant is to summarise, with a sigh of satisfaction, the neatness of 'fit' of our observations to some theory. Assembled out of all the accumulated observations, some new 'hyper-sum' (Latour , 2007, 61) that provides knowledge for future analysis of other, unrelated worlds To achieve such a conclusion is to see much erased , to allow so few of the multiple actors whose 'micro-interactions' accumulated (Latour, 2007, 48), as to have possibly rendered a world unrecognisable to its participants.

This description has detailed a conclusion of sorts in the termination of the prototype design, its leaving the laboratory and travelling. The researchers met their target date, set in part by the money streams available to the prototype project that ordered the temporal outline of the work. In retrospect, and with some surprise given the circuitous and vulnerable nature of the innovation, the vignettes have also described how the work 'more or less' mapped to the planned stages outlined at the first meeting. This could tempt a neat summary and have us argue that the project ended up where it intended, and where it would go, all along! Returning to the 'eureka' moment, recaptured by the Researcher in her speech for the eventual launch of the realised site, suggests that the researchers had no idea how to go about their work nor how it would 'end'. Looking for a way to do something better, they assembled new orders of things but had no idea at the outset, what might emerge from their innovative effort.

Both content and information infrastructures were partial, fragile and highly variable and like Aramis, the connections from the project went "all the way to the minister" (Latour, 1996). The Clearinghouse, a new actor in the regulatory landscape, would locate and be located by mobilising 'new 'technologies to mediate across intermittently connected boundaries. By assembling human and non human resources in a mix of for-grounded and background performances, it would collect and effect ordered access to the negotiated regulatory media 'ecologies' being worked out in New Zealand/Aoteoroa and through them, some global media worlds. By making the

representations of the practices of media regulation freely available the hope was to enrol and enable informed debate between a set of diverse actors and knowledges. This would create the possibility of "new creative linkages between media industry, ICTs, media researchers and educators", an "equipped citizenship" and an "integrated means of tracking media data and trends related to young people" (Zanker & Barclay, 2004).

Regulations and standards are 'simply' inscriptions punctuating chains of evolving socio-technical infrastructures. They record and provisionally stabilise, with varying degrees of success and longevity, the interactions between humans and objects. Regulations are attempts to detail definitions of relationships (Vinck, 2003), associations and collaborations. Because they tend to render visible some connections that hold, the infrastructures of regulation and policy, and how they are worked, can provide good places to start research.

The researcher's utilisation of civic orders of worth to make the project a worthy task ordered their passage. An inability to complete would have resulted in the risk of some negative consequences from bureaucratic quarters, however, since the researchers knew they had effectively worked a multiplicity of strategies to make a prototype, lack of realisation would not necessarily have equated to failure. What pushed the researchers to make the invention work were beliefs that such a space could perform effectively at the boundaries between regulators, audiences, technologies and media and thus facilitate better informed flows of co-construction. This desire to establish equivalence, to build a space within which disputes between different regimes could play out in the virtual, emerged from critical moments in regulatory worlds. Perhaps the researchers worked "virtual" justifications from domestic, market, opinions and civic worlds across the architectures of the site rendering compromises in their representations that could work broader shifts of worth in the "real" world?

Certainly, the researchers concertedly moved between worlds to get the job done. They talked of silos and were acutely aware that their task was to work different

modes of evaluation into the site. The detail of how New Zealand's media systems fitted together was minutely dissected so that it could be moved and reassembled into the website architecture which would in turn render explanatory content and lead back out to the collected links and worlds of interest. This analysis of their knowledges was characterised by the kind of discursive pragmatism that Girard and Stark describe. The researchers were constantly balancing the distinctive domains of their professions– librarianship, media advocacy , academic research and media education – with the requirements of "getting the job done" (Boczkowski, 1999; , 2004, 206; Girard & Stark, 2003).

'Simply' designing web navigation is to perform social-technical ordering. Where Callon has observed that engineers transform themselves into sociologists when they are most caught up in technical questions (1991, p.136), The Clearinghouse researchers were acutely aware of their transformation from social researchers into engineers, performing the co-construction of complex alignment of humans and non-humans (Suchman, 2001, p.168) in "endlessly debated" configurations. As for the web designers of Girard and Stark's new media laboratory, the researchers soon discovered that the software's available to them had inherent limits on rationalisation (Eischen, 2003). This ebb and flow of invention made for fraught and disruptive methods that were solved by endless workarounds. Thus Boltanski and Thevenot's notion of competing orders of worth, moderated for the worlds of web design and representation via Girard and Stark's observations of simultaneously negotiated practices into heterarchies has some utility for making sense of the researcher's world of invention.

Yet something of the effort on the part of the researchers to work a newly conceived space cannot be adequately accounted for by neatly ascribing their efforts as simply creating equivalence across their resultant architectures.

Both researchers had finely attuned abilities for reflexive action. They constantly held up for inspection the terrains to be mapped as well as their own and the project's relationship to those terrains. While seeking to stabilise navigational architectures and

content for the site they were simultaneously following the shifts in those terrains. Although not having recourse to the concept of 'boundary object'or 'boundary infrastructure', they had an acute understanding that the balancing act of detailed design and enrolment of people and things being attempted was certainly in the realm of what Star describes as "delicate diplomatic structures", often composed of a variety of boundary objects. (2002, p.118).

The description that the researchers conjured up for themselves and articulated in the proposal document maps well to the idea of something which enables different groups to retain their difference yet at the same time draw on the resource for their own informational needs. The project was participating then in several circuits of co-evolving invention at once. All their arrangements were trying to offer multiple kinds of users ways to negotiate and collaborate across gaps in a dynamic system of invention. A uniquely evolving experiment in New Zealand's media de-regulation was co-evolving with the re-invention and transformation of the NGOs which contributed to its public consultative processes. These in turn, as Bach and Stark have highlighted, (2004) were taking up opportunities to communicate in new ways that were reshaping and transforming interactive media to their purposes and in doing so co-evolving yet newer media.

The concept of 'trading zone' might well have some utility for articulating the worlds of software collaboration into which the prototype project necessarily journeyed. Perhaps the unsuccessful attempt to associate the elements required to establish a repository of digital objects, linked and accessible via the Clearinghouse could be articulated as a lack of an effective trading zone having been defined by the multiple interests in data worlds. That story, though not detailed in this work, continued along multiple trajectories. A description of data strategies currently being worked might well gain from considering whether the softwares that connect, collect and disperse content act as boundary objects or trading zones… or neither?

What of the minute movements of design practice though? As for any mappers of worlds, the researchers had to turn inwards to dominate the complex terrains beyond

their site of invention. Like Mrs Baysal, the researchers in the Amazon forest, or Pasteur, Norbert and other characters in the descriptions of Bruno Latour, Suchman, Wakeford or Vinck's designers or Mackenzies' software designers, the researchers spread out paper, created tables, enlisted a cast of whiteboards, manipulated little yellow post-its, all in a effort to make visible connections between things that, although inextricably linked, did not always appear so until they were collated. It might be observed that Latour made his reference to sheets of paper well before digital tools such as spread sheets became ubiquitous. Yet the description has illuminated that the researchers, defeated by the structures of digital tools, took recourse to exactly those things Latour, Suchman, Wakeford, Mackenzie and Vinck describe. Paper, whiteboards, post-its – all non digital assemblages working digital worlds.

The list-making for the prototype navigation, the endless reconfiguration of categories and the minutiae of classification has been the focus of this description. Although at the outset the researchers were described as hybrid performers of research and parenting, this thesis has not sought to follow the traces of any observed gendered actions in the story. Nor does it describe the work that assembled all the elements of graphic design for the site. The translation of worlds into referential images is a huge part of the story which would be well worth description.

In selecting what to include the research has re-presented what the traces show. That it was the work of ordering and reordering people and things which predominantly organised the world of the prototype's invention. By 'naturalising categories' via the invention of immutably mobile design devices the researchers performed a kind of 'material problem solving' (Bowker, 2005) that shifted multiple worlds into their laboratory and out again. By transforming the scale of their terrains of interest yet maintaining their contingent disagreements, the representation of multiple worlds in the prototype created an aggregate of comingled capacities. Their work did not configure the users towards operative compromises or agreement. They 'simply' (and this simplicity has now been exposed as a bit of a joke) sought to render available an unfolding series of 'clickable' connections.

9. Practicing reflexivity

> "Here we had moments of concern which sometimes edged towards panic."

> (Law, 2003, p.5)

What is this piece of work? What purpose is it worthy enough for?

Well, primarily, it is a linear written text created on a pc in Microsoft Word in a format and style that complies with the requirements for a Master of Arts degree at the specific institution to which it will be submitted. Yet that is only one of the weights on the chain of its creation.

The work of this thesis is an attempt to practice the methods of re-presentation, a form of combinative ethnography(Bazanger & Dodier, 1997), by describing my own work on the invention of a website. The writing, reflexive and retrospective, has been marked by a struggle with the inherent tension between following one's nose (Harvey, Quilley, & Beynon, 2002) through the circulations of a world and the necessarily method-logical task of deciding how to do it. This difficulty has been enhanced by the unnerving question which arises for the student learning to utilise the toolbox of ANT/STS – that is ,once you have grasped the concept of considering all actions and networks of association in a world as part of the social facts to be translated into the text – ie: not just the people - then what? How does making some plan of the action fit with being sure the writer privileges the actants of the field without recourse to a priori assumptions or theorising. The field is to be represented as a series of partial pictures to form a description adequate for the purpose? (Becker, 1986p. 121) … But what is the purpose again?....

'Mediascape' became a social fact out of a passage from political need through idea formation, to concept definition in documents, to enrolment of funds and resources to

the creation of a prototype. Once stabilised in the prototype the idea was presented to likely supporters who funded the evolution of the actual thing – the live site. All the bits comingled 'effortfully' (Boczkowski, 2004,p. 210), constrained and enabled but all the time being an effort to map, to classify and to explain.

The researchers talked up the web of connections in endless conversations, the precise details of which are now lost. Their traces, moments of notation, tell much more because we have the remembered traces of this writer to add to them. Some detail has slipped away for sure but not to the extent that other studies of the role of graphic representations and draft notation would suggest. Blanco(2003) concluded that without the presence of the participants it is not possible to infer meaning from traces and drawings left behind. Perhaps this would be true if we did not have recourse to the memory of one of the participants. But this combinative ethnography of memory and practice is of course one of the themes of this study.

When, at the outset of working for this thesis, I read Bruno Latour's *Pasterurisation of France* one line stuck " if you must have infrastructure…." Such arrogance by the author towards the reader! The pointed sigh of impatience with the reader's need to classify challenged and negated the sociology of the macro in which I had been schooled. Introducing *Reassembling the Social,* Latour himself acknowledges the opinionated tone of his writing (Austrin & Farnsworth, 2005 p.x). As I read more of writers who attempted to describe the complexities of collaborative work of new media and science innovators I realised that Latour and his STS collaborators seek to offer a bridge, a way in for the macro thinker who investigates the 'social' to shift their gaze from the pattern to the specific elements. To privilege the human and non-human actants equally.[76] To consider the 'science' part of 'social sciences', both in terms of the need to acknowledge the extent to which science and technology have become integrated with daily life in ways never considered by the forbears of traditional sociology and in terms of the minutiae of method. To practise a

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[76] Much of the specificity of STS/ANT language is caught in translation needs to be addressed. Also, the more I read from the French school I learned not to take too seriously the specific words utilised in

"revamped" critical method - a science of associations and circulations (Austrin & Farnsworth, 2005). Such a focus peels away the *a priori* expectations of the researcher and makes the task one of adequately describing the field, its disjunctions and eruptions, the assemblages and alignments, the ordering and constant reordering of the elements which the work of that world is.

I also discovered that 'infrastructure' is a word to which a multiplicity of meanings has been associated. Latour's impatience undermined a very central concept of the other thread of writing that seemed to me to resonate with the world I was trying to describe. For Leigh Star and Geoffrey Bowker, rendering the background arrangements, the infrastructures of information work, is an acutely worthwhile task to the point that they might argue description is worth*less* without them.

How to resolve this for my description? Obviously, if I sought to describe networks of code and wires that 'hold up' digital interactions some notion of infrastructure ought to be used. The point becomes not to consider infrastructure as an enabling actor, any more than a Marxist might see capitalism as the enabler of the owners. Movement occurs (or not) via infrastructures. Infrastructures themselves describe arrangements of mutable and immutable mobiles that tend only to be viewed in retrospect.

For this understanding I was extremely grateful that a multiplicity of worlds to which I was variously associated had delayed my writing to the point that by mid 2007 Latour published on his website[77] two pieces that helped me make sense of the historicity of the task of description (2007a; , 2007b).

Could I, as the observer/researcher/storyteller take the situation and render it comprehensible in all its composite parts? Can there be equal privilege in a field? Probably, because this is my first attempt it is unlikely that I would succeed in making such a transformation of method 'in one go'. I have been learning the skills of the

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the translation to English.
[77] http://www.bruno-latour.fr/

'field worker', becoming au fait with the ideas of a range of writers whose ideas were new to me, as well as being at the periphery of several disciplines together with attempting to forge into cyberspace with pedantic and political intent.

What I could do though is to privilege enough of the components to ensure that the nuance, the slices of time and the complexity of the minutiae were articulated. It requires considerable daring, to break away fro the structures argument. My graduate colleagues look surprised when I tell them there may be no "conclusion" but how can there be when it is not my argument but rather the point of the description I am trying to make.

The struggle to tell the story is no less than the struggle with which it was 'lived'. The traces of building a world have been stored in paper, digital files and in the images and emotion of memory. Laid out here in linear translations they are fixed to some extent to a chronology. The 'project', beginning as prototype, achieved a stable 'end' of sorts. There are also thematic considerations – the parts of the dream that wove in and out of the building work, in and out of the building where the work was done. There are the conventions of the work, the building of the laboratory itself as equipment was enrolled and manipulated to get the job done. There are observable shifts when new actors begin to appear or when others leave but the actors are in varying sizes (Latour, 1996, p.44) and their size is not necessarily indicative of their importance to the story. The paper traces end well before the prototype was finished. They moved to digital collections, stored and ordered by file name not chronology, wrapped into and evolving order of the 'site' itself.

Selection necessarily erases. Classification is necessarily relative. (Bowker & Star, 2000, p.290) This is a story that both uses those processes to construct a text and describes those processes. It is a text, intended for printing on paper, to be bound and shelved in an academic library – a configuration that has not kept pace with the socio-technical processes of academia. It cannot include embedded hyperlinks to digital objects, to the actual prototype itself. It can only attempt the challenge of translating the world into words. To do this, the description employs a number of styles. To show

the connections that seeded the project and those that were worked back and forth between the laboratory of its invention and worlds that it bordered the description weaves selected memories with evidence from the traces detailing them in narrative form, expressed in the third person present. This narrative form is interspersed with reports of selected stages of the design process.

To do justice to the detail of the work such description inevitably gives weight to some and erases other aspects of that work. The text ought thus to be taken as an exercise, an attempt to 'practice' using the tools of the STS 'toolbox'. Its success ought to measured on how well it affords symmetry to its actors, how effectively the background is brought forward in order to make visible how the job was done.

And what of time? Is it acceptable that I am telling you this in retrospect? Doesn't that in itself rewind, erase, overwrite and distort the telling. The period of observation, captured by the archived traces that are *re-presented* in the description chapter of this thesis, limits the domain of inquiry to the 'completion' of the prototype and its associated proposal document. Of course there was 'in fact' no 'end' to observation just as there was no end to the project. Once fixed as the assemblage of disc and document the prototype, as is the purpose of all good prototypes, was utilised successfully to enrol sponsors and so achieved 'buy in' (Zanker, 2006c). Money was committed to make it 'real'. Like Latour's observed laboratory, this saw a "dramatic increase in numbers [as the project]… spread out in space and time" (Latour, 1987, p.108). The researchers, of which I was one, became part of a 'team' while codes, images and objects multiplied in all directions.

My employment on the project, making the website a real thing, continued to the end of 2005 and took significant time away from the writing of this thesis. Thesis and project comingled reflexively as for any participant observation. In mid 2006 the thesis was again suspended due to the ill health of my supervisor, Terry Austrin. In his absence, I was fortunate to have the opportunity to assist in teaching his graduate class, SOCI 401. While this delayed the thesis further, it afforded me the chance to learn by teaching much of the literature that informs the methodology I was attempting to

practice.

This extended temporal aspect of the work on both projects presented a significant research problem, making effective translation from the traces difficult. They became historical. Where once the task was a challenge because it was so immediately familiar and all detail seemed un-sortable, now, the archive of traces had become a raified thing. During the first phase of the project, each of the small snippets of paper, doodled on hand-written minutes together with their neatly transcribed versions, sketches and scribbled ideas that communicated moments were collected and filed chronologically, latest on top. For the second year of the project they sat in their red folder, beside *that* year's current file. References circulated between them as ideas stabilised in the first phase informed those being worked up in the second. The labels on these folders traced the passage of the projects attempts at stabilisation: "Kidsmart", "Mediascape", "Mediascape 2". By the third year their historicity had become manifest and the "Kidsmart" folder was redeployed. The original design notes were transferred into a red archive box labelled simply: "Prototype". Entrusted with this box, I brought it to the university to copy every small snippet, carefully trying not to disturb any ordering or layering. Punched and filed into another (black) folder these copies render the archive mobile but the distance that I needed to trace now seemed vast!

Unlike the soil samples from the Amazonian forest in Latour's description, brought back to Paris as "neatly little tagged bags of dirt"(Latour, 1999b, p.74), my 'samples' had been displaced largely in their entirety. Unclassified, they sat in a folder on my desk in the Sociology Department Graduate 'lab', like layers of an archaeological dig,[78] waiting to be painstakingly dusted back to the bare bones that build the skeleton of description. Somehow disconnected from the present, monochromatic and thus already with some references erased, I merged into this chronology my own notes that

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[78] For this methaphor I am indebted to Dr Ruth Zanker who, one day, made the connection when discussing my thesis with me. Ruth's empathy for the cause of thesis writing rested beside the work we undertook on the web project and on occasion provided much needed encouragement. I also valued her trust that I would treat the material worked between us with appropriate rigour.

trace critical moments of observation. Like the photos I stored, some from the digital camera, so huge in format that they are poor travellers, and some snapped on my phone that travel well but display poorly, these notes on paper designated for the task, captured moments of clarity – where the mix of work transpired to cause a link in my cognition and forced me to pause to note it.

One of the key research problems this work encountered was how to begin the description? How to translate the chronology and the memories, the world of invention, into words. Inscribed on my student profile, neatly tucked away on the University server, my "p" drive, are files and document, words and pictures in Microsoft Words and Powerpoint, that mark numerous beginnings. I have presented brief descriptions to graduate conferences and one undergraduate class, rendering linearly the chaos of simultaneous invention. Whatever I wrote, it seemed that Geoff Bowker, Bruno Latour, Susan Leigh Star, Marilyn Strathern, Adrian MacKenzie or my supervisor, Terry Austrin, had already said it better! One moment I felt there was some mastery to the performance and the next I would slump into the despair of a fledgling apprentice.

Versions proliferate. These inscriptions have taken on a chaos of their own as they have distributed themselves across my personal storage mechanisms – data sticks, laptop, pc hard drive and home network storage drive (which we affectionately call "the toaster" for its appearance). Beginning, 'for real' has involved collecting all these bits together. Sorting, classifying, selecting and, crucially, erasing. This is same process again, the same work that renders pretty much anything into mobile, communicable form.

At my desk in the graduate lab I began, through words typed by my inept finger touches into the humming digital mechanism of keyboard, local hard drive, network, server. Building these tenuous bridges I started to cross the 'gap' between our work of invention and my work of description. Moving back and forth through the paper and digital inscriptions, I traced my way back to the minutiae and layered detail of the assemblages that built the domain of my interest along two routes. One route is to

write the memories. It's a risky business to use a narrative form for an academic piece but the language from the toolbox I had assembled (see Chapter 2) stood this description in good stead. Memories simply trace associations; they act as mediators along the chain which separates the experience and the retrospective telling of it. Provided the reflexive symmetry is maintained in the relating of them, they offer an opportunity to illuminate detail.

The chronology in my black folder has been reordered from the original. The first page is a screen shot of my username typed into the login screen of CPIT's web portal. Lastnamefirst initial: barclayb. During the course of the research I negotiate network identities, this one, my student one (jb47) and my home one. Behind each of these ordered protocols are the messy lines of my hybrid performance: researcher/mother/student/wife/parent/designer/volunteer/, varying hybrids of inscription that align to varying attachments.

The second route traces the inscription of the website. But where to begin this? Which way to trace? It is a key problem. It was tempting to write one of those irritating texts that can be read from either end, but that would be a tacky narrative. The literary summaries, already crafted and a little too neat and linear for my liking might be wrenched apart with footnotes that work the literature and the description, much like those in Mol's seminal text (2002). It is certainly the case that the literature summary has been wrenched from what was, in experience, a threaded discovery of sociological observations that accompanied the research. But, how readable would that be?

Writing

The work of writing the description was long and slow in coming together. Certainly, the disruption to the process caused by the multiple connections and contesting orders of worth from family, the prototype project, the residues and opportunities of advocacy work still demanding attention contributed to the disjunctions. The nature of my own thinking, 'big picture', 'multi-platforming' and plural, also made it hard to

stick to the task amongst the many interesting leads ones intellect might follow. This is part of the discipline of learning to write, responses to the ebb and flow of dictates from supervisors and bureaucratic deadlines and finally claiming the thesis as a work.

However, the main problem of getting the world folded into linear words was in sifting through and sorting the ordering of them. Many, many beginnings were made, some lost to corners of my hard drive and forgotten and some erased as being thin when read in retrospect. Some beginnings were in first person and were challenged as privileging 'myself'. Some captured moments and did manage to fold the work onto words and so were drawn through all the way to the final version of the text. This 'drawing through' metaphor is one that persisted form the start. An early introduction included this:

> "…struggling with the best way to put up the tangled web of threads which I have followed. One solution would be to team with a programmer and throw up a holographic rendering of the complexity of the project of which I am innovator, perpetrator and observer. Then I could let you pull on the threads dangling from a suspended image and let you discover how it was for yourself by attaching to the virtual string, artefacts of the process: images, emails, conversations, digital objects. Unfortunately that will have to wait for another project.

> I have toyed with the idea of presenting the thesis as an electronic book with hyperlinks to glossaries, pages, emails and texts, photographs and web pages but there is a tension there for the "fit" with the academic tradition which still holds. So instead I have elected to stay within that frame and use a linear form of textual creation which is writing. The assumption is that this drawing of complexity with words, which has been the craft of the scholar for so long, still effects the discipline necessary for effective communication to the "reader" . Perhaps it is more that this method allows me to dictate the hierarchy and control how you make your way through?"

Why was the process so difficult? Early on I grasped the notion of the method, the

symmetry required by the writer's gaze. For a time perhaps I went too far, privileging the object to the detriment of the humans. Chapter 4 emerged from this realisation. The post-its were erasing too much, the humans became backgrounded politics! This rectified, the description chapter (eventually Chapters 6 and 7) that embedded all the work and re-presented it to a reader unfamiliar with that world, still struggled to be written. It became an actor to which I referred as having its own will. At no stage did I doubt the worth of the method. By all means 'simply follow', but having faithfully followed, what to do with all those traces!

Conversations with a fellow MA student, working two cubicles along from me in the 'grad room' revealed that he was having a battle with his description chapter also. Rather curiously, given that we were working very different literatures and methods to produce two very different texts, we discovered that our writing process was taking similar paths. We were both 'stuck' and unhappy with our description chapters. Writing to the 'theory', commenting on other writers was hard, but this was so much harder. Towards the end of the conversations we had each independently concluded that it was the quality of our research that impeded us. We would do it differently next time.

How that difference for each of us played out would most certainly be qualitatively different but the common understanding from these discussions provided a reflexive understanding of the learning that had taken place as part of the thesis writing.

For my part, I would consider more carefully how the traces of world to be described might best be 'captured'. It is not possible to capture all traces and follow all chains, yet incredibly, that is what I had tried to do! Such folly had simply impeded the work.

In trying to avoid *a priori* research questions that ordered the research from beyond the references I had spent some weeks determined to win the battle with the non-compliant Descriptive Chapter 6. I had tried, ordering the photos and writing to them. I had tried ordering the vignettes and re-inserting the photos. This just led to a week of creating multiple versions that risked clogging the hard drive and a monstrous

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multiplication of file names. New description had emerged from this process but it sat in snippets, awaiting configuration in adequate sequences.

It is easy to say there is no end and no beginning, to visualise in the mind's eye the endless web of connections that weave and thread their way in and out. The conceptual notion of this and its methodological implication is that there is no 'right' place to start, and by implication, no wrong place. It is much, much harder to practice this when actually beginning. Text, being linear, is at variance with the simultaneous nature of reality. Links which are clear in concept become highly elusive in translation into words. Huge 'scapes' of socio-technical domains become dry and lifeless on screen and even where to set the traces and memories is hard to resolve.

It occurred to me to ask "What ordered the work?" and thus, what ordered the world. There was Latour's 'simply'!

Method/ology: or how I followed myself

If *a priori* generalisation that characterises the theories of the founding writers of sociology is insufficient to describe the asynchronous, convergent nature of new media innovations and organisation, is what is left 'sociology'? Yet if this kind of work is better classified as anthropology then how does the researcher manage the research in the close, familiar environment of one's own sites of belonging rather than these with neatly defined geographical borders of a distant shore and culture? What if the 'things' to be described are of one's own sites of circulation? One's own hybrid self – in my case mother/wife/housekeeper/ researcher/advocate/website innovator…-

I read the writers who make such salient descriptions, use the language of ANT so eloquently and then I come to write ….and I write over and over. I write the same beginnings over and over and never seem to get to the middle. But there it is! The essential research problem for the student of a sociology of association: there is no middle!

At sites where innovation is occurring there are nodes, passage points, that are the performances at the intersections of action. They are the clusters of action where the chains of translation along which people and things are moving intersect, coincide and where something new is made. A person who is at one of these intersections might seem to be at he centre of the action, but let them take one step sideways, or go into a next door office, let the printer run out of ink or the roof leak in the main server room causing all main servers to close, and then suddenly they are peripheral, or at least just one of the actants that needs to collaborate for action to occur.

The project described, with me integrally linked to it, came first. The idea to use the project as a field came second, though relatively soon afterwards. Thus one of the problems of the thesis moves beyond the issue of intervention on the part of the researcher (Ribes, 2005). It undoes the idea if testing and proving 'theory' to the point where method becomes essentially the only useful vehicle for illumination.

So how best to describe what was done? How to drag the simultaneous, co-incident mess of action into a comprehensible "story". Ironically I am acutely uncomfortable with the ordering of the story. The struggle is that to practice the symmetry of ANT requires me to consider myself one of many actants, yet the whole story has relied on my memory, my notes, my interpretations and my ordering of events. Of course what we were doing in trying to map NZ media ecologies was a research process in itself. I was researching research. We thought of ourselves as researchers becoming designers just as Callon has observed engineers became social scientists.The circulations, which in the process I often thought of as performing in one endless mobius strip closed in one sense when I used the current version of 'Mediascape': to research the work.

A note about the photos and other working assemblages

The photos travelled. Mostly taken on a personal digital camera brought to the site for the express purpose of recording the project for the thesis, they were taken back and uploaded onto a home PC hardrive on which was installed the correct software – software, port, connection and camera were aligned in order so that the digital codes

that re-presented the world as an image could move from one to the other. Once residing on this drive, the images were then available for transportation, via CD Rom, to the university office. To have uploaded them directly was inhibited by a myriad of factors – not least of which was my lack of knowledge about how the camera downloaded its images. Even had I acquired this knowledge the requisite software, connections and layers of access and permissions would have prevented it. Thus the images had to be translated into a form acceptable to the student profile on my university account. Access to that profile on the P drive, is via a desktop pc, connected via a network cable that extended all the way form the central servers . This network – in the literal as well as the metaphorical sense – has played an important role in the building of the thesis. Considered the most reliable of storage solutions it is, nevertheless, a temperamental monster. Certainly, a trusty storer but its operational capabilities, dictated by space allocations which in turn dictate the power available to run applications in tandem off the desktop, has meant at times my work process has entirely constituted of reconfiguring document management strategies. Content becomes irrelevant at these junctures.

I learnt: Endnote cannot be opened when Word is in outline view or nasty codes corrupt the document. To solve that one took me all the way into the back room of the Library IT department! I learnt to close Word every half an hour to placate the localised temporary files on the hard drive on my desk. I learnt never cut and paste – always insert from file and 'edit special' or else a multiplicity of formatting instructions would travel around the document and attach themselves in monstrous hybrid orders of appearance.

Once, a dreadful warning message which leapt up just after I had merged all chapters into one document "*Thesi*s", took days to solve. Working back and forth between possible culprits (hard drives, pen drives, network connections, profiles and ports) Antoine, the department's IT support and myself contested various theories. In the process the work migrated back and forth between my home and the University as I tried to work the most stable solution for forward momentum. A lag in updates of one version of Word to another turned out to be the problem for which Antoine had to

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force a workaround on my machine until the IT network could catch up. This small vignette had big consequences in that IT were alerted to reprioritise the update across the campus.

Such boring things! Plugs, wires, cables and code. The process of writing was most certainly a parallel knowledge pathway. The working of references and ideas required mapping, ordering and collating. To do so like everyone, as Latour claims, who tries to represent the social, spread out a large sheet of paper (Latour & Herman, 2003, Plan 5).
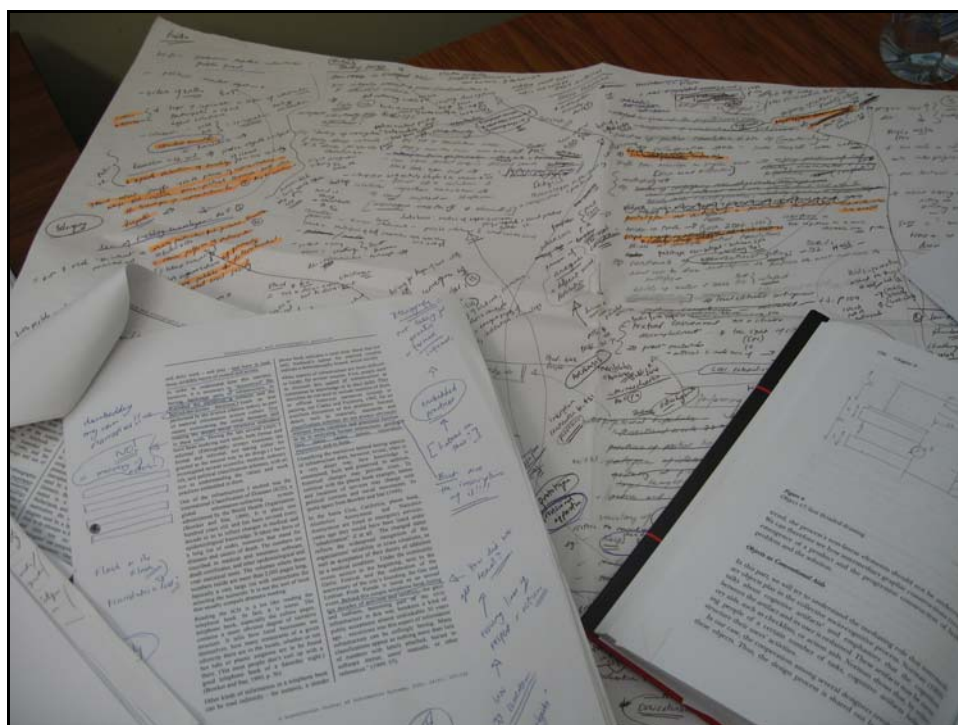
Figure 20: Representing the social

A multiplying collection of journal articles, collected via the miracle of electronic journal subscriptions and delivered through permission of my enrolment at the university to my desktops and subsequently the printers, were ordered alphabetically by author into a filing tool that enabled transportation between home and the grad lab. Only one, Lucy Suchman's '*Building Bridges'* came as hard copy across the sea in a brown paper envelope. All the rest were 'traded' across the multiplying data zones proliferating in academic worlds over the course of my research.

References were also collected digitally in 'Endnote' that, with the latest version of

the thesis, travelled back and forth on data stick. At various stages the work exploded on the desk in the grad room and, as the ideas were carefully rendered commensurable in ordered text, slowly replaced into their neat orders.

Figure 21: References proliferate

This travelling library went back and forth innumerable times, finally coming to rest in my dining room as the final stages of the thesis were undertaken around the routines of family.

Figure 22:A travelling library

As the thesis slowly cohered my hybridity was continually being worked. Eventually, a kind of tortuous closure, characteristic of such endeavours, was effected and the thing was completed.

10. Hybrid Closures

October 2007

In the dim light of The Auckland Museum's central gallery, I make my way around the visiting exhibition. Curated by The American Museum of Natural History the exhibition traces the work of Darwin through a chronological arrangement of artefacts from his life and work. Its catalogue summarises:

> "The exhibition re-creates [Darwin's] experience with live animals, like those Darwin himself encountered, along with actual fossil specimens he collected. 'Darwin' also features an elaborate reconstruction of the naturalist's study at Down House, where, as a keen observer and dedicated experimenter, he proposed the revolutionary theory that all life evolves according to the mechanism of natural selection. Rare objects on display, coupled with descriptive text, illuminate the patterns he observed among species, which led to the publication of the astonishing and brilliant The Origin of Species, wherein he assembled the massive evidence of life's diversity, animal and plant domestication, and the geologic and fossil record to support his theory of evolution."("Darwin", 2007)

The gallery leads from the newly enclosed atrium with its extraordinary suspended theatre – an ark- floating over the visitors' entrance. As I make my way around the objects, transported and reassembled, I begin to notice some resonance of its displays with my hybrid worlds.

I did not make a point of visiting this exhibit. I am in Auckland with one of my children. We cannot get a flight home today because it is the Friday before a long weekend, so we are finding things to do. I am trying to complete this thesis. Its passage, like that of the Beagle, has been long and tortuous.

In my satchel, which weighs on my shoulder, I carry an assemblage of things that connect me to my various worlds. My phone receives periodic texts from my

children and husband at home – my memory is the repository that coordinates their actions. My key ring, as well as carrying an assemblage of keys that afford access to offices, home and vehicles also transports my data stick. It is my repository for this thesis. On its ordered trees are archived artefacts of the work: the prototype site, images, reference files and, most importantly, the latest version of the thesis. Also in the satchel is a paper that I have re-read on the plane during the journey here.

A Textbook Case Revisited: knowledge as mode of existence (Latour, 2007b) the paper begins with a description of an exhibition of horse fossil history which Latour uses to describe "a certain asymmetry in our reactions to science studies". Presented simultaneously in that exhibition were the 'classic version', a straight trajectory thought to be the horse's 'story' of evolution that led to a larger, tall horse and a second, less linear story. The curators also presented the 'revised' less simple and more multiple version of the evolution of the horse's skeleton that articulated the process as a 'branching bush' of transformations allowing for some variability and temporal complexity. This 'double historicity of science', which superimposes the parallel lineages on the 'progressive transformation' of the horses and the progressive transformation of our interpretations of those transformations exemplifies the dual knowledge making pathways which Latour maintains research should try to re-present .

Discovering this paper on Latour's website has been one of the most significant benefits of the many delays which have meant this thesis is being completed so long after its beginning. The paper's claims about the importance of pathways of knowledge acquisition needing to be represented with their consequent subject matter draws together some of what I have attempted to do in describing my location "Inside Out".

As I make my way around the exhibits my attention waxes and wanes. At one point I text my husband an excerpt from Darwin's comment on the usefulness of a wife -"good for one's health - but terrible loss of time". [79] He replies with a

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[79] "[to provide]Children-(if it Please God)…constant companion, (& friend in old age) who will feel interested in one,—object to be beloved and played with-better than a dog anyhow...home, & someone to take care of house-charms of music and female chit-chat.—These things good for one's health.-but terrible loss of time." http://www.aucklandmuseum.com/451/a-wife...that-most-interesting-specimen

query about bank accounts! As I stand watching the lizard, those most ancient of species, waiting for him to blink, I get a call from the dentist asking to change an appointment. Time and location begin to take on a very curious, folded quality.

After exploring orchids, pigeons and the things of Darwins' county house garden I reach a recreation of Darwin's study. Its label reads:

"In this comfortable, cluttered study "really part library, part laboratory - Charles Darwin spent most of his days at Down House".

The curators have encapsulated the hybrid assemblage of my thesis!

Next I discover the series of notebooks in which Darwin inscribed and transported his ideas. I begin to appreciate that the exhibition is, of course, built from the ordering of Darwin's inscriptions and, in turn, his work was, as laboratory studies claims, a matter of collecting inscriptions to describe a world.

A replica of his first sketch of the "tree" resonates with the trees of classification I have tried to describe. I know from following the traces of Grinnell' s Museum of invertebrate Zoology that this tree has now made a myriad of translations onto the web, a collaborative effort of biologists from around the world to 'map' the diversity of organisms on Earth, their evolutionary history.
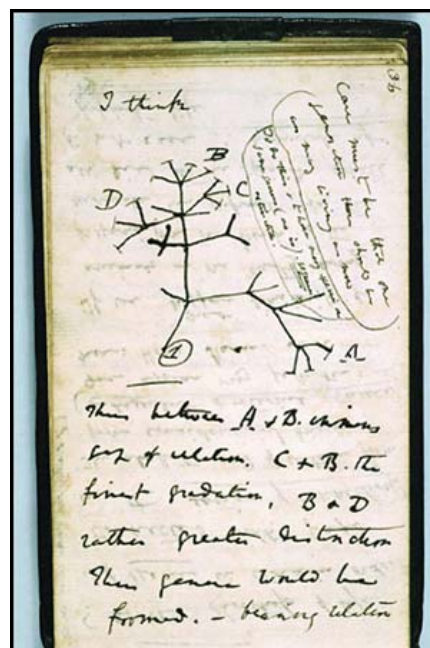

Figure 23: Darwin's notebook

Figure 24:www.tol.org

This 'tree' is also embedded into the interactive digital exhibit that I stop to play. I reflect on myself as one of Barry's active participants…. (Callon, 2004)

Spurning the video of cells mutating and almost ready to leave the exhibit, I turn and casually peruse the remaining exhibits. In one corner, static by comparison with all the digital colour and noise of the surrounding displays, is a portion dedicated to explaining the 'branching bush' of evolution. There, in microcosm, is a portion of exhibit described by Latour. Standing beside the skeletons of horses and reading the label that describes the 'branching bush' and dual knowledge pathways of their evolutions I take Latour's paper from my bag.

In that moment my research found its proportions, its relevance. Latour claims, we cannot invent an all encompassing, singular 'Sociology'. What we can attempt is 'sociologies', which accumulate and may associate into a 'branching bush' of worthy descriptions.

Excitedly reading to my friend from the battered paper, also inscribed with all my notes and resplendent in several different coloured highlighting, I provide amusement to a passing curator. I wonder if he has read the Latour piece. It ought to be mandatory reading for any curator – both as an observation and as a celebration of their work!

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Returning to Christchurch I present the experience at a seminar for post graduate students. Its threads weave beginnings of new research dreams with the literatures of the thesis. I make some slides, assemblages of images, which detail Grinnel's collection and its contemporary databse, a screen shot of my thesis files and thr trees form Darwin'd exhibition.

A lecturer asks a question about the "metaphor of the images of the trees" that order the worlds of information hierarchies I have described and whether I have considered them in relation to theories of 'rhizomes' as relational networks.

"These trees depicted" I reply "Darwin's 'I think', the tree of life, Grinnell's collection at the Museum of Vertebrate Zoology, now searchable through web inquiry form, the tree of my stored files on my hard drive… these are not metaphors anymore. Though such description of them may have begun metaphorically, this work of following 'ordering' is not theoretical. Rather this interest in the work of relational association is realisable, observable and worthy of description. It is a method for inquiry into a multiplicity of information worlds.

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