The Pinboard in Practice: A Study of Method through the Case of US Telemedicine, 1945-1980

CRAIGE, WILLIAM,ARTHUR

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William Arthur Craige

PhD in Applied Social Science

School of Applied Social Science,

Durham University

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Abstract

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William Arthur Craige

In view of calls for sociology to engage more thoroughly with method and methodological innovation (Law, 2004; Savage and Burrows, 2007) this thesis presents an exploration of John Law's (2002) 'pinboard' method. Grounded in the ontological and epistemological premises of post-Actor-Network Theory (post-ANT), the pinboard is an analytical method which attempts to engage with the 'messiness' of reality by articulating its complexity, diversity and non-coherence which are all typically erased in traditional narrative accounts. Law's explication of the pinboard is imprecise, however, and even within the context of post-ANT literature it is a method which has seen very little use. Hence, in taking up the pinboard method this thesis works, firstly, to illustrate what the pinboard method might mean in practice and, secondly, to offer of it a critical discussion and evaluation.

In doing this, the thesis works through a series of empirical case studies related to the early practice of 'telemedicine' in the US between roughly 1950 and 1980. Based upon both contemporary and recent documentary resources as well as a small number of interviews with early telemedicine researchers, these pinboards are contrasted with existing histories of early US telemedicine to produce a comparative illustration and discussion. On the basis of these case studies, it is argued that the pinboard can be successfully used to produce decentred, 'messy' accounts of ontologically complex realities as is argued by Law. As a result of both practical and conceptual issues, however, the pinboard nevertheless performs reductions and erasures of its own thereby rendering it complementary to narrative accounts rather than antithetical.

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Contents

List of Tables

Abbreviations

APA American Psychiatric Association

CMH Community mental healthcare

HBMC Home-based medical care

HCTD Health Care Technology Division

HEW Department of Health, Education and Welfare

LAMS Logan Airport Medical Station

MGH Massachusetts General Hospital

NPI Nebraska Psychiatric Institute

NSF National Science Foundation

NSH Norfolk Stat Hospital

RHA Rural Health Associates

STS Science and Technology Studies

Introduction

This thesis is about practices of knowing in social research. Specifically, it explores a particular practice of knowing which John Law (2002) refers to as a 'pinboard'. In brief, this is a method of social research which attempts to engage with the 'messiness' of reality by articulating its complexity, diversity and non-coherence, all of which are typically erased by conventional social science narrative accounts. The thesis undertakes this exploration through an empirical study of US telemedicine research and development between roughly 1950 and 1980. Contrasting its own accounts with extant descriptions of US telemedicine's early history, the thesis constructs a discussion of the value of the pinboard as a part of social scientific practice, as well as of its liabilities.

The central problem of the thesis is articulated in the following quotation from John Law:

> "Parts of the world are caught in our ethnographies, our histories and our statistics. But other parts are not, or if they are then this is because they have been distorted into clarity… If much of the world is vague, diffuse or unspecific, slippery, emotional, ephemeral, elusive or indistinct, changes like a kaleidoscope, or doesn't really have much of a pattern at all, then where does this leave social science? How might we catch some of the realities we are currently missing?" (Law, 2004: 2)

Law, here, expresses concern about the limitations of existing social research methods. While he accepts – indeed, *stresses* – that 'traditional' social research methods are both effective and useful, he contends that they are nevertheless incapable of knowing many kinds of realities. In particular, he argues that they are ill-suited to knowing complexity, heterogeneity, and difference. Indeed, 'traditional' social scientific practice – most often intentionally – *erases* the 'messiness' of reality as a result of specific (if oftentimes implicit) ontological and epistemological assumptions which render 'mess' an epistemic problem. Law, however, rejects this rendering, contending that 'messiness' is not noise or static inhibiting a true understanding of reality but that reality *is simply messy*. Therefore, in order to know complex, heterogeneous and non-coherent realities it is necessary to deploy alternative practices of knowing which can engage with, rather than erase, these realities.

As a result of this, Law is interested in producing a "broader, looser [and] more generous" sense of method freed from "the normativities that are attached to [traditional social research methods] in discourses about method" (Law, 2004: 4). In other words, he envisages

a social science devoid of methodological hegemony, open to and accepting of practices which attempt to know in a manner different to the traditional methods of social research. Law's argument, however, is not simply about producing a 'better' social science but is deeply concerned with issues of politics and power. This is because, for Law, social research and its methods are not simply about knowing but about *producing* realities:

> "Method… unavoidably produces not only truths and non-truths, realities and non-realities, presences and absences, but also arrangements with political implications. It crafts arrangements and gatherings of things – and accounts of the arrangements of those things – that could have been otherwise" (Law, 2004: 143)

A more extensive discussion of this argument will be presented below and in Chapter 1 but the basic thrust of Law's contention is that through (social) scientific practice – through method – organisations, institutions, laws, policies, technologies and many more things are made (or unmade). Knowledge-producing practices make things relevant (or irrelevant), visible (or invisible), significant (or insignificant). "To describe the real," according to Law, "is always an ethically charged act" (Law, 2009: 155). Seeking to 'broaden' social science method, then, is about producing and articulating realities which 'traditional' social research methods cannot. If, as Law argues, conventional social research methods are especially poor at knowing complexity, heterogeneity and non-coherence, then social research is incapable of articulating and producing those realities. As such, in the context of social scientific knowledge and its applications, those realities are implicitly rendered invisible, irrelevant and 'Other'. Even worse, by attempting to apply order and coherence to realities which are neither orderly nor coherent, conventional social research methods may well be complicit in the production of precisely the kinds of power and domination which social scientists have so frequently worked to resist (Law, 2008).

According to Law, then, social science requires methodological innovation in order to both improve its knowledge-producing capabilities and also to engage in the production of a more just and fair world. But the necessity of methodological innovation has also been the focus of recent sociological debate more generally (e.g. Crompton, 2008; McKie and Ryan, 2012; Osborne et al., 2008; Ruppert, 2013; Stanley, 2008; Uprichard, 2013; Webber, 2009). Central here is the work of Savage and Burrows (2007; 2009) who argue that academic sociology is at risk of becoming obsolete if it does not turn method into its key strength:

> "[I]n the years between about 1950 and 1990 sociologists could claim a series of distinct methodological tools that allowed them to claim clear points of access to social relations, but in the early 21st century social data is now so routinely gathered and disseminated,

> and in such a myriad of ways, that the role of sociologists in generating data is now unclear" (Savage and Burrows, 2007: 886)

Savage and Burrows write of a sociology in crisis. To paraphrase, their argument is that sociology's strength in the second half of the 20th century was derived from methods it invented and developed expertise in. In particular, Savage and Burrows point towards the survey method, sociology's "great and enduring contribution to the scientific study of society" (Savage and Burrows, 2007: 889), as well as the in-depth interview as sociology's principle sources of power. However, in the late 20th century and into the 21st the strength of these methods has, they argue, been in decline. On the one hand, the societal and academic contexts within which these methods were produced and which afforded them their successes no longer exist. On the other, alternative methods, particularly in the form of digital transaction technologies which produce data entirely outside the capabilities of academic sociology, threaten to obsolete sociology's now aged practices. On top of this, sociology can no longer claim exclusive expertise in 'its' methods as they have become routine activities in both state and commercial organisations to produce what Thrift (2005) has called 'knowing capitalism'.

The consequence of this, so it is argued, is that empirical sociology is at risk of having little – if anything! – to offer the study of 21st century societies. In conclusion, however, Savage and Burrows do not lament the passing of empirical sociology. Instead, they suggest that if sociology has historically drawn its strength from methodological innovation and expertise, then methodological innovation and expertise are sociology's future. In other words, Savage and Burrows pin the success of 21st century academic sociology upon its ability to develop new and powerful ways of knowing. With regards to this, they encourage in particular an emphasis upon methods of description and classification. This focus is based partly upon a variety of critiques of causal analysis, "which we [sociologists] are very bad at" (Savage and Burrows, 2007: 896), advanced by the likes of Andrew Abbott and Bruno Latour (on this, see also Savage, 2009). More importantly, however, the authors articulate their emphasis upon description as a political concern. The business of collecting and analysing the kinds of transactional data which are said to be obsoleting traditional social research methods are primarily orientated towards the construction of classifications (Savage and Burrows, 2007). This tendency is reflected in software such as SPSS – a widely used statistical software package – which has over the last decade been transformed by the inclusion of a wide variety of new statistical techniques dedicated to the description and classification of quantitative data (Uprichard et al., 2009). As such, Savage and Burrows argue that "if we see the power of contemporary social knowledge as lying in its abilities to conduct minute description, we can

better situate our concerns as exposing these descriptions, challenging them, and presenting our own" (2007: 896). In other words, through developing its own methods of description and classification, sociology might work as a critical counterweight to the otherwise hegemonic knowledge practices of commercial and state organisations. Methodological innovation, then, is not only about the continued longevity of academic sociology but is also – as in Law's argument – a political project.

This thesis, then, situates itself within the contexts produced by Law and by Savage and Burrows. Accepting Law's contention that there is something missed by the conventional practices of social research, the thesis sets out to examine an alternative practice which Law (2002) refers to as a 'pinboard'. The pinboard method, as will be discussed below, is a method which works against the reduction of complex realities to simple, cohesive narrative accounts and which therefore attempts to articulate and perform complexity rather than erase it (ibid.). Law's articulation of the pinboard method, however, is not especially developed in its details and there are few studies which have made explicit use of it. Therefore, the aims of this thesis are as follows:

- To produce a clear outline of what the pinboard method entails in principle;
- To illustrate through an empirical study what the pinboard method entails in practice;
- To compare the pinboard method with alternative methods of social research; and
- To present an evaluation of the pinboard method's strengths and liabilities

In so far as the thesis offers an articulation of the pinboard method, however, it also stands as a contribution to the extensive methodological work which has been sparked by Savage and Burrow's 'Coming Crisis' argument (e.g. Back, 2012; Marres and Weltevrede, 2013; Masson, 2011; McKie and Ryan, 2012; Ruppert, 2013; Webber, 2009). Hence, the work presented in this thesis may be of concern not only to those interested in Law's methodological work but also those interested more generally in practices of knowing in social research.

The remainder of this introductory Chapter is divided into three sections. The first offers an illustration of the problem which is central to Law's concerns regarding conventional social research methods. To do this, it works through a short example grounded in the empirical case which is used throughout this thesis: early US telemedicine. Following this, the second section offers a more detailed overview of early US telemedicine to familiarise the reader and to indicate its suitability as a topic. And in the final section, an overview of the rest of the thesis is presented.

Illustrating the Problem: Stories of Telemedicine

Exhibit I.1: On 4th October 1960, a passenger aircraft crashed into Winthrop Bay barely a minute after taking off from Logan Airport in Boston, Massachusetts. Striking a flock of starlings as the plane left the ground, one of the aircraft's engines failed and another two suffered a temporary loss of power. The plane veered towards the Bay and, reaching stall speed, plummeted into the water just off the coast (Civil Aeronautics Board, 1962). In response to the accident, emergency crews were dispatched to provide medical assistance to the survivors, but delays were suffered as a result of the intense Boston traffic and as a result the final number of casualties was estimated to have been greater than it might otherwise have been (Park, 1974). In the end, sixty-two of the seventy-two people on board perished (Civil Aeronautics Board, 1962).

In the aftermath of the disaster, with a view to reducing the likelihood of a similar incident in the future, the Massachusetts Port Authority invited Massachusetts General Hospital (MGH) to open a medical facility at Logan Airport (Park, 1974). Accepting, the Logan Airport Medical Station (LAMS) was completed and opened in January 1963. The medical station was staffed 24-hours-a-day by nurse-clinicians: nurses trained to provide routine care for non-emergency cases without the supervision of a physician. To supplement this core staff, physicians from MGH would visit the medical station during peak hours. In addition, in the event of an emergency or difficult case the nurse-clinicians could contact physicians at MGH by telephone to consult or receive instruction (Bird, 1975).

Several years later, in 1968, MGH and LAMS would become the sites for one of the world's first contemporary telemedicine systems. This system comprised of a two-way interactive television connection which allowed individuals at the two sites to see and communicate with one another. Armed with remote controls, a physician at MGH could manipulate cameras positioned at LAMS to carry out a visual examination of the patient while a camera located at the hospital provided some symmetry by enabling the patient to see the remote examining physician. A nurse-clinician stationed with the patient would act in a supporting role, carrying out physical tasks which could not be undertaken by the remote physician. In this way, the physician located at MGH could examine, diagnose and create a treatment plan for patients located several miles away, without ever being physically co-present.

This is a story about the invention of 'telemedicine'. It tells of a series of events which led from an air crash to the establishment of an interactive television system between Massachusetts General Hospital and Logan Airport Medical Station. It is not the first telling of this story: it appears similarly in Ben Park's old book, *An Introduction to Telemedicine* (1974) and it is repeated in the much more recent *History of Telemedicine* by Rashid Bashshur and Gary Shannon (2009). It stands, then, as a canonical part of telemedicine's history; it is undisputed and without controversy.

> **Exhibit I.2:** "In the months prior to [the opening of LAMS] there was discussion among hospital staff, as there was in other places, about such health care issues as the shortage and maldistribution of physicians, the growing need for generalists, the changing role of the nurse, and the general need to find new ways to be responsive to a changing environment…
>
> "The primary interest [at first] was to determine how well the nurse clinician would perform in a highly responsible position, particularly [if they could access a physician by telephone or radio]. We learned what many already knew: the telephone is an effective vehicle for health information exchange that can aid in the delivery of direct services if skilled professionals learn how to use it…
>
> "By mid-January 1963, it became evident that telecommunications could be used in an even more effective way to provide direct patient services, either primary care or consultative. In fact, the ability to see and examine the patient at a distant site through a confidential microwave television transmission might enable a new type of medical care to emerge" (Bird, 1975: 91-92)

This is another story about the invention of telemedicine. Authored by Kenneth Bird, director of LAMS and a key figure involved in the creation of the MGH-LAMS television system, it is complementary to the narrative presented in Exhibit I.1 in so far as it provides details which were absent from that first account. Firstly, it explains the particular operational structure of LAMS by describing some contextual details pertaining to health care provision in the 1960s. Given that physicians were not in ready supply, nurse-clinicians were employed as an alternative under the assumption that nurses - given appropriate clinical training - could tackle many of the routine cases which would ordinarily be dealt with by medical doctors. The provision of telephone consultation was therefore deployed as a means of supporting this system by ensuring that appropriate expertise could be accessed even in the absence of

physicians at the medical station itself. Secondly, it explains the deployment of interactive television as an outgrowth of the success of this initial system. The nurse-clinician proved to be effective as a primary care provider and telephone consultation an adequate way of providing expert support. Given this success, television was a natural extension which would be "even more effective" than the telephone through affording the consultant physician the capacity to perceive the patient for themselves rather than working through verbal descriptions.

> **Exhibit I.3:** "During its second week of operation the nurses at Logan Station called Dr. Bird at Massachusetts General Hospital to report that a 60-year-old female patient had tripped and fallen. Her pain was so severe that the nurses felt she should not be moved without expert consultation. At this point, Dr. Bird felt very acutely the need to <u>see</u> patients at the medical station when neither he nor another physician was present. He thought about the possibility of acquiring a live television interconnection and went to the United States Public Health Service for assistance. They invited him to submit a grant application for a system of telediagnosis" (Park, 1974: 25)

This is a third story about the invention of telemedicine. Written by Ben Park in his book – *An Introduction to Telemedicine* (1974) – it is nevertheless almost certainly derived from an interview conducted by Park with Kenneth Bird as much of Park's research material was based on personal communication with telemedicine researchers and practitioners). Again, this narrative is complimentary to the one presented in Exhibit I.1. It does not, however, cohere so neatly with Bird's account presented in Exhibit I.2. Bird's account is teleological: television use is explained as developing naturally from the successful use of the telephone in the provision of expert support for nurse-clinicians. In contrast, Park's account indicates contingency. Rather than being a natural development of existing practice, using television is indicated to have emerged from a specific event – the fall of a 60-year-old woman – without which telemedicine might never have happened. Hence, while Bird's television system builds upon the *success* of the telephone as a means of supporting nurse-clinicians, Park's implicitly emerges from the telephone's *failure* to convey information – visual information – which was considered necessary for the case at hand. In other words, according to Park's account the telephone system alone was insufficient as a means of providing support to nurse-clinicians and a superior alternative – identified as television – was required.

> **Exhibit I.4:** "Like so many professors [Bird] was moonlighting. And what was he moonlighting as? He was moonlighting as the medical director of Logan Airport Medical Station, which was only three and a half miles from the Massachusetts General Hospital. But unfortunately he had to go under the Charles River to get there through the Sumner Tunnel which was the only tunnel under the river, and of course it took him an hour each way. And so he... said 'Jay' and I said 'I know Dr.Bird, I know you got caught in traffic again'. He said 'yeah, I did, but I had this great idea, what do you think about it?' He said 'what if I put up a microwave antenna between the Mass General and Logan Airport and I put in some TV cameras and I start to examine patients over TV! What do you think?'" (Jay Sanders, interview)

Here is a fourth story. It is derived from an interview that was conducted for this thesis in 2012 with Jay Sanders, an intern at MGH in the 1960s and later one of telemedicine's most ardent supporters. Once more, it is complimentary to the account given in Exhibit I.1 but at odds with the narratives presented in Exhibits I.2 and I.3. According to Bird (Exhibit I.2), using television emerged out of the success of using the telephone to provide support to nurse-clinicians. According to Park (Exhibit I.3), using television emerged out of the failure of the telephone to afford access to information which might be critical to the treatment of a specific case. But in Sanders's account (Exhibit I.4), the use of television emerges as a solution to the frustrations of travelling through the intense traffic of Boston's streets. Using television, then, is not so much about supporting nurse-clinicians (as in the previous accounts), but instead about supporting *physicians* by allowing them to practice at LAMS without having to physically travel there.

Taken individually, each of these stories constitutes a cohesive and plausible narrative that explains the emergence of the MGH-LAMS telemedicine system. But when taken together, the stories constitute three different, competing explanations instead. Bird's narrative (Exhibit I.2) asserts that the MGH-LAMS television system was implemented as a development of the previously successful telephone-based link. But Park's (Exhibit I.3) asserts that it was the limitations of the telephone system which led to an interest in television instead. Sanders (Exhibit I.4), meanwhile, presents a further explanation through asserting that the television system was implemented as a replacement for physician visitations to LAMS.

Taken together, then, these three accounts are productive of controversy. That this is the case is not at all remarkable. Controversies, and their resolution, are more or less the *raison d'être* of scientific practice (see, for example, Latour and Woolgar, 1986; Latour, 1987). However, controversies serve as excellent sites through which to explore, amongst other things, the practices of knowledge-in-the-making (Latour, 2005). What is of interest, then, is not so much the controversy itself but the methods by which a social scientist might go about resolving it.

John Law (2002), faced with a similar situation to the one outlined here, describes two different approaches to engaging with such controversies. "On the one hand," he states, "we may imagine trying to create a better narrative, one that more closely accords with the events as they actually took place. In this case we treat… [the differences] as an issue of method or epistemology" (Law, 2002: 157-158). This approach would begin with the basic ontological assumption that there is a single set of definite actors, objects, actions and events which produced the MGH-LAMS television system. Accordingly, it would assume that there is a single truthful narrative account which corresponds with and describes that reality. Given these assumptions, the differences between the accounts of Bird, Park and Sanders are problematic since they all describe different realities and as such cannot all be true. The issue, then, is to determine which of the accounts corresponds best with reality; or it is to determine which parts of each account are truthful and which are not. In any case, it is a question of knowing and, as such, a question of epistemology.

> **Exhibit I.5:** There are a number of reasons why Sanders's account presented in Exhibit I.4 might be disbelieved. Firstly, Sanders had no direct involvement in the establishment or use of the interactive television system constructed between MGH and LAMS and therefore cannot claim direct knowledge of the reasons for its creation. Secondly, this account was elicited decades after the event described which implies the possibility of it being a product of faulty memory or retrospection. Finally – although this is difficult to convey through a written transcription – the account Sanders gives has the feel of a well-rehearsed anecdote which may have been deployed more for its entertainment rather than its facticity.
>
> In contrast, given that Bird was the creator of the MGH-LAMS television system, one might be inclined to ascribe truth to his own account presented in Exhibit I.2. However, there are reasons to disbelieve Bird's narrative as well. By making reference to contextual issues in health care provision (i.e. physician supply and maldistribution) Bird not only describes the emergence of the television system but also – implicitly – offers a

justification for its use. Furthermore, by describing interactive television simply as a "more effective" use of telecommunications than the telephone, interactive television is rendered a development of *existing* practices rather than a set of radical new practices. Given the hostility of many physicians to the idea of using interactive television in health care, Bird can plausibly be interpreted as attempting to render the idea of interactive television more palatable (something consistent with other complementary texts published by Bird and his colleagues). In other words, Bird's account might be concerned more with generating interest in interactive television than with presenting a true account of its emergence.

For these reasons, the narrative that Park presented in Exhibit I.3 is likely to be the most accurate description of events. Although Park himself was not involved in the production of the MGH-LAMS system, his account is most likely derived through conversations with Kenneth Bird (as the two were acquainted at the time) or through interview (as Park conducted several as research for his book).

Exhibit I.5 is one example of how the problem created by the alternate accounts of Bird, Park and Sanders might be resolved. It works by interrogating the origins of the three accounts, thereby determining which account is most likely to be valid. In it, Sanders's account (Exhibit I.4) is rendered problematic as he lacks proximity to the events described. Speaking as an outsider to the creation and operation of the television system and speaking decades after the fact, the ability of Sanders to produce a truthful account is brought into question. Bird's account (Exhibit I.2), on the other hand, is rendered problematic through the suggestion that its primary purpose is to interest its audience in telemedicine rather than to describe with fidelity the circumstances of its emergence. In other words, it is not clear if Bird's account is an accurate description of telemedicine's emergence or a retrospective reconstruction intended to present telemedicine in a particular fashion. Since the validity of these two accounts is in question, the remaining account (Park's; Exhibit I.3) can be deduced as the account most likely to be truthful and as a consequence the accounts in Exhibits I.2 and I.4 are discarded. In the end, then, the controversy is resolved by deleting the accounts least likely to be truthful.

Exhibit I.6: The idea of using interactive television to provide health care services to patients at LAMS emerged not long after the medical station opened. In the first few weeks, the telephone proved to be an adequate means by which support could be provided to the nurse-clinicians working at LAMS (Bird, 1975). However, this system

> quickly demonstrated its limitations. One incident, described in Park (1974), involved a 60-year-old woman who was experiencing severe pain after having suffered a fall at the airport. The nurse contacted Kenneth Bird – director of LAMS – at MGH, but he was unable to provide the assistance he thought was necessary because he was unable to see the patient. Driving to the medical station proved to be a further problem as the intense Boston traffic resulted in a journey lasting around an hour each way (Jay Sanders – interview). Troubled by the limitations of the telephone system and frustrated by the time involved in travelling between the hospital and the airport, Bird conceived of interactive television as a way of building upon the successes of using the telephone while overcoming its limitations.

Exhibit I.6 is an alternative method by which the differences between the various accounts might be reconciled. Unlike in Exhibit I.5, this method assumes that each of the three accounts possesses a partial truthfulness. This is meant in two ways: firstly, in that each account is taken as possessing some truth even if they also contain some falsehoods; and secondly, in that each account is taken to be a part of the true narrative explaining the emergence of the MGH-LAMS television system. It functions, then, by taking coherence as a benchmark: those elements of each account which fit together have been extracted as truthful, while elements which cannot be made to fit the emergent narrative have been abandoned as (necessarily) false. On these grounds, for example, the 'product of success' narrative which was manifest in Bird's account (Exhibit I.2) has been dropped in favour of the 'product of failure' narrative manifest in Park's (Exhibit I.3) as this allows a more coherent account to be produced. Additionally, to fit the elements together in a coherent fashion, some assumptions have been made. For example, Bird's statement that "it became evident that telecommunications could be used in an even more effective way to provide direct patient services" (Exhibit I.2) has been interpreted as an allusion to the specific event of the elderly woman's fall which Park describes in Exhibit I.3. Sanders's story in Exhibit I.4 is integrated as an extension of that incident. The final product is a coherent narrative in which all the parts hang together and drive the story towards its conclusion.

Narrative, Law argues (2002: 188), is "a powerful tradition… of ordering, of consistent explanation, of foundations, of origins". It is powerful, yes: narrative draws things together; it produces coherence; and it erases contradictions and inconsistencies such that "what lies behind the confusion of appearance" is explained (ibid.: 191). Exhibits I.5 and I.6 above exemplify this: while they work in different ways, both in the end constitute a coherent explanation devoid of inconsistency or non-coherence. The emergence of the MGH-LAMS is

explained. But, yes, narrative is also tradition: it is an approach that underpins much social scientific practice while its ontological underpinnings are more common still. So narrative – powerful and traditional – is one method of resolving the differences between the alternate accounts presented above.

Here is the other:

> "On the other hand, we may ask what would happen if we abandoned the idea that the exhibits describe a single set of [events] and instead [take up] the idea that they are *performing* different distributions" (Law, 2002: 157-158; original emphasis)

The alternative that Law postulates here is founded upon an ontology dissimilar to the ontological underpinnings of narrative outlined above. It is a semiotic ontology, understanding reality as *relative rather than absolute* and as *a product of practice rather than as pre-given*.

Attending to the first of those points, to say that reality is relative is to say that the real is always situated: all things exist as part of specific contexts with which they interact and from which they derive their form. In Annemarie Mol's words, "[n]othing ever 'is' alone. To be is to be related" (2002: 54; see also Law, 1988). Mol's (2002) study of 'lower limb arthrosclerosis' is, indeed, a classic example of this notion in practice. In her text, Mol describes a variety of different 'lower limb arthroscleros*es*' situated within particular parts of a Dutch hospital where her fieldwork was based. In what she calls 'the clinic', for example, 'lower limb arthrosclerosis' exists as an interaction between patient and doctor. It is a collection of things: pain on walking, articulated through the doctor's questions and the patient's stories; coldness of the skin, made manifest through the doctor's touch; weak pulse, again made manifest by the doctor's application of pressure at the groin, knee and foot; and so on.

Elsewhere, however, 'lower limb arthrosclerosis' is something else. In the pathology lab, it is an image, viewed through a microscope, of a cross-sectional slither of artery cut from an amputated leg and dyed pink. There is, here, no pain, skin temperature or pulse; instead there is a thick artery wall viewed through a microscope. Elsewhere still, in the radiology department, 'lower limb arthrosclerosis' is different once more: a trace, or rather an absence of a trace, in the patient's lower legs of a radioactive dye injected into the patient's circulatory system and transformed into an image via an x-ray machine. And so on. Mol's argument, then, is that in each of these places – the clinic, the pathology lab, the radiology

department – 'lower limb arthrosclerosis' is something different. These are, in other words, all different realities of 'lower limb arthrosclerosis' situated as part of different contexts.

If 'lower limb arthrosclerosis' is multiple, however, then "it also hangs together" (Mol, 2002: 55). It is here that the notion of 'complexity' emerges. On the one hand, there is multiplicity: a variety of different 'lower limb arthroscleroses' performed as parts of different contexts. On the other hand, these different realities are all – in some way or another – connected such that (but also *because*) it is possible to talk or write about 'lower limb arthrosclerosis' as a single object. Most simply, enactments of one version tend to go along with others. Perform arthrosclerosis-in-the-clinic and one will tend to perform arthrosclerosis-in-the-pathology-lab and arthrosclerosis-in-the-radiology-department, too. But a single object is also performed, for example, through the transformation of measures produced within different versions of 'lower limb arthrosclerosis' into a common comparable format, thereby making each version equivalent with the others. Medical theories, too, produce a single object through providing cohesive explanations which link the elements of different versions with one another. Even where performances contradict one another – where one version of 'lower limb arthrosclerosis' is enacted but another is not – a single object is maintained. Physicians produce rationalisations to explain away contradictory results. Some versions of 'lower limb arthrosclerosis' are considered more reliable than others in determining whether a patient 'really' suffers from the disease. And so on. Complexity, then, arises from the fact that objects are *both* singular *and* multiple. Objects are "partially connected" or "fractionally coherent" (Law, 2004; but also Strathern, 1991): they are comprised of a multitude of different realities which, through practice, overlap partially and therefore constitute the object as singular.

At this point, the discussion has already moved to consider the second of the two points made above: that reality is a product of practice. As has just been suggested, if different versions of 'lower limb arthrosclerosis' hang together as a singular object, then this is because of a variety of practices which *make those realities equivalent with one another*, thereby producing 'lower limb arthrosclerosis' as a single disease. Without those practices, so Mol argues, the disease 'lower limb arthrosclerosis' would not be.

But practice is not integral only to the performance of 'single' objects. Consider arthrosclerosis-in-the-clinic: physicians *ask* questions, *touch* skin, *feel* pressure and *deploy* knowledge while patients *answer* questions, *talk about* pain and *tell* stories. It is through all these practices (and more besides) that arthrosclerosis 'in-the-clinic' exists. If they are not performed – because the patient refuses to answer the physician's questions; because the

physician determines the patient's pulse to strong; because the patient never goes to see a physician in the first place; or whatever – then again there is no 'lower limb arthrosclerosis'. Or, better put, there is no arthrosclerosis-*in-the-clinic,* since other versions of it ('in-the-pathology-lab', 'in-the-radiology-department', or whatever) might still be performed. To argue that realities are made through practice, then, is to highlight the "craftwork" (Law, 2004) which is involved in producing and reproducing realities. Practices make (and unmake) associations, make things relevant or irrelevant, make things present or absent, and so on. And accordingly, these practices of reality-production can themselves be transformed into topics of enquiry.

A social science underpinned by semiotics, then, points towards different kinds of knowledge and knowledge-producing practices. If 'things' and their 'contexts' always come together, then knowledge-producing practices must avoid their separation. If there are a multitude of different things-and-their-contexts, then what is ordinarily considered a singular object can in fact be articulated and performed in a multitude of different ways. And finally, if realities are made then it is possible to produce knowledge not only of the realities so produced, but also of the practices which made them. Semiotics, in other words, produces reality-in-the-making as a topic of social scientific enquiry.

Returning to Law, then, two moves are made in his postulated alternative to narrative. Firstly, by asserting that different accounts "perform *different distributions*", Law suggests that different accounts may be descriptive of *different* realities. Each might be true, relative to the specific reality it describes and constitutes. Secondly, in asserting that different accounts "*perform* different distributions", Law suggests that accounts of reality are themselves methods of enacting – that is, *making real* – the realities they describe.

Law's postulation, then, leads towards two simultaneous understandings of the accounts presented in Exhibits I.2-4 above. On the one hand, each of the accounts can be understood as a description of a different reality of the MGH-LAMS television system. On the other hand, however, they can also be understood as different examples of reality-making practices. In both these ways, it is the *differences* between the accounts which are rendered central. As such, the non-coherence of the three accounts in Exhibits I.2-4 is not an epistemic problem to be solved through reconciliation but instead a key point of scholarly interest. Law's alternative to narrative, in other words, directs attention to quite different questions: what realities of the MGH-LAMS television system are produced through various accounts of its emergence; and how do those accounts go about producing these realities?

It is impossible to answer these questions through the kinds of practices exemplified in Exhibits I.5 and I.6. In both examples, the heterogeneity which makes each of the three accounts significant is erased in order to produce a coherent narrative. Indeed, that is *precisely the point*. Non-coherence is enacted by those methods as an epistemic problem, a problem which those methods quite effectively resolve. The erasure of ontological complexity, then, is not a collateral consequence of narrative methods but instead their very purpose. Accordingly, narrative methods are incapable of articulating, knowing or performing ontological complexity of the kind written about by those such as Law and Mol.

In conclusion, then, if social research is to engage with ontological complexity then narrative will not do. In order to engage with and articulate heterogeneous realities, their differences and the practices which produce these, alternative knowledge producing practices are required. To be clear, this is not to suggest the replacement of narrative with some other kind of method. The realities performed by narratives are no less real than those performed by any other method. The point, instead, is to suggest that narratives are capable of knowing and performing realities only in particular ways and that to know and perform reality differently requires a different set of practices.

What those alternative practices might be remains an open question. Law, however, has articulated one possibility in his notion of a 'pinboard'. This is based upon a logic of

> "juxtaposition, of pastiche, and yes, it claims that somehow or other these bits of paper, these postings, are more or less equivalent. That they exist together on the same surface and may expose themselves without the necessity of a single order, may jostle one another. Yes, they may make links with each other or overlap. They may resemble one another or differ. Help one another or not. But this is a logic that also supposes that they do not, except coincidentally, belong to one another as part of a single, larger whole. They do not, except coincidentally, belong to the same narrative" (pp. 189)

Law's explication of a pinboard is neither detailed nor prescriptive. Broadly speaking, a pinboard account might be understood as the inverse of narrative. If narrative is about tying things together, then a pinboard works to keep things apart and separate. If narrative is about erasing non-coherence, then a pinboard is instead about exploring and articulating these differences and non-coherencies. And if narrative is about producing smooth and seamless stories, then a pinboard is about producing a patchwork: rough, jagged and full of edges. But none of this articulates how a pinboard account might be produced, or how a pinboard account might be presented. It might, perhaps, resemble the discussion of Exhibits

I.2, I.3 and I.4 above, but without their reconciliation in Exhibits I.5 and I.6. That is one possibility. But it is not apparent that it is the only one.

Here, then, is the central problem that the thesis grapples with: what exactly is a pinboard account? The thesis addresses this question in two ways. Firstly, in Chapter 2, the question is asked: what is the pinboard method in principle? Answering this question requires that the pinboard method be disentangled from a more general concern with semiotics and fractional non-coherence, as although there are many examples of research grounded in a semiotic conceptualisation of reality few do this in accordance with a specific analytical approach.

Secondly, through the empirical case studies presented in Chapters 3, 4, 5 and 6, the question is asked: what is the pinboard method in practice? Here, the principles of the pinboard method outlined in Chapter 2 are transformed into a series of empirical examples so as to both illustrate and work through them in action. In answering this second question, then, the concern is not only with explicating the pinboard method but also evaluating it as a method in its own right and in comparison with the conventional methods with which it is juxtaposed.

The Case: US Telemedicine, 1950-1980

In order to work through the pinboard method in practice, the thesis presents a series of case studies related to early US telemedicine research and development (occurring, roughly, between 1950 and 1980). This empirical work draws primarily from documentary sources including published and unpublished research papers and reports, conference proceedings, grant applications, newspaper articles, notes, personal letters and so on. To supplement this, a small number of targeted interviews were conducted with persons active in early telemedicine research. Together, these sources are deployed in the service of three accounts of early telemedicine. The first, presented in Chapter 4, offers an overview of early US telemedicine in juxtaposition to other historical accounts which are reviewed in Chapter 3. The second, presented in Chapter 5, focuses on a particular telemedicine system which was constructed and in service between 1955 and the mid-1970s in the US State of Nebraska. The third and final account – presented in Chapter 6 – focuses on telemedicine research in the 1970s and especially the decline of telemedicine activity from the mid-1970s onwards.

Telemedicine, here, is not to be defined. There are two reasons for this. Firstly, there are a multitude of definitions of telemedicine. Most basically, Conrath et al. (1983) define telemedicine simply as “the application of telecommunications technology to health care delivery”. Barrett and Brecht (1998: 9) define it similarly, but through etymology: “Just as *telephone* means sound (phone) across distance, *telemedicine* is medicine across distance”.

While both these definitions are arrived at differently, they are similar in that they do not explicitly prescribe the kinds of technology used in telemedicine or the specific applications of that technology, thereby leaving telemedicine open. Others definitions, however, are more restrictive. Park (1974: 1), for example, defines telemedicine explicitly as "the use of two-way or interactive television to conduct transactions in the field of health care", hence defining telemedicine specifically in terms of television technology. Bird (1971: 3) similarly emphasises television where he defines telemedicine as "the practice of medicine without the usual physician-patient physical confrontation or [as] the practice of medicine via interactive television". But Bird's definition, however, explicitly makes reference to telemedicine involving the provision of direct patient services, while Park does not explicate specifically what the function or use of telemedicine is. Hence, Park's definition is more open in terms of the application of telemedicine systems. Moving slightly away from formal definitions, Viegas (1998: xxi) describes telemedicine as indistinct from any other medical technology:

> "It is important to remember that we are not discussing new medicine or new types of healthcare, but rather new technology that is being incorporated into medicine. Incorporation of technology is not unique – in fact, the development and use of new technology and equipment in medicine is common."

Yet Viegas's assertion contrasts significantly with that of Bashshur (1997: 6-7) where telemedicine is defined as a revolution in health care organisation:

> "Only when viewed as a complete and integrated network will telemedicine's unique distributive capabilities and integrative functions be maximised... Optimally, telemedicine may be viewed as an innovative **system of care** that can provide a variety of health and educational services to its clients unhindered by space and time. As a system of care, *it entails a new organizational form*" (original emphasis in bold; added emphasis in italics)

Telemedicine, therefore, has been defined by a variety of writers in a multitude of different ways. Of course, it would be simple enough to choose one of these definitions and pursue it, or else recombine them into a new definition deployed for the purposes of this study. However – and here is the second reason for refusing a definition – to do this would be to perform telemedicine as a singular, stable and coherent object and therefore close off the study of its non-coherence before it even began. Put another way, it is precisely one of the purposes of the pinboard method to articulate the many different versions of telemedicine

which are enacted elsewhere and specifying in advance what is meant by telemedicine is antithetical to this aim.

Rather than defining telemedicine in advance, then, various telemedicines will be defined through the case studies presented in later Chapters. The boundaries of the study, therefore, are not delineated by recourse to a specific definition of the topic. Instead, in the absence of an *a priori* definition of telemedicine, the thesis bounds itself by focusing upon the activities and projects which were considered to be (controversially or otherwise) telemedicine during the period of interest (i.e. ~1950-1980). Since telemedicine was primarily associated with the use of interactive television used to provide direct patient services, this will inevitably be a key focus. However, a host of other issues and themes will intersect this: alternative telecommunications technologies; alternative functions; organisational and infrastructural arrangements; healthcare policy; science funding; research methods; mental health care practices; and so on.

As will be demonstrated in Chapter 3, there is significant variation in terms of what is considered to be the earliest telemedicine practice. For example, some accounts refer to radio systems used in Norway and Alaska in the early-mid 20th century as the earliest telemedicine systems (e.g. Moore, 1999). Others (e.g. Bashshur and Shannon, 2009) point instead towards experiments undertaken by Dutch physician Willem Einthoven around the turn of the 20th century. Eikelboom (2012) instead points towards the use of a telegraph system to provide emergency medical advice in Australia in the latter half of the 19th century. And so on. While all of these examples might rightfully be considered telemedicine, this thesis is concerned with telemedicine practice only from the 1950s onwards as this is when telemedicine as an explicit concept began to emerge. Hence, earlier examples of telemedicine-like practice are of concern to the thesis only in so far as they were relevant to the notion of 'telemedicine' emergent in the 1950s and '60s.

The empirical case studies extend their concern as far as 1980 to encompass all of what is commonly referred to as the 'first wave' of US telemedicine. Waning political interest in the mid-1970s resulted in a moratorium on US telemedicine research, since the telemedicine projects of the 1960s and '70s had been almost entirely reliant on State- and federal-level research grants for set-up and maintenance (Chapter 6 examines this matter in detail). While some small telemedicine projects continued, by 1980 all of the major research projects established in the 1960s and '70s had been disbanded and there were no further projects of significance established until the late 1980s (concurrent with new digital technologies). Hence, 1980 is a natural stopping-place for the empirical work.

Telemedicine is an apt case to work through in this study for two key reasons. Firstly, there is already a large amount of literature which has been written on early telemedicine. This literature, however, makes use of conventional narrative methods to describe early telemedicine and explain its development. For example, early telemedicine is frequently written into a narrative of continuing technological progress which reduces early telemedicine to a set of limitations or problems which would only be overcome with the advent of digital technologies (on this, see Chapter 3). This literature is useful, then, as it can be used comparatively to place the features of the pinboard method into relief and to provide a means by which the pinboard method might be evaluated.

This opportunity for comparison is enhanced by the fact that much of the original source material used in the production of – to date – the most detailed history of telemedicine (Bashshur and Shannon, 2009) is accessible via an archive held at the US National Library of Medicine. This allows for a comparison of methods while drawing upon largely the same set of sources, thereby demonstrating that differences cannot be reduced simply to differences in the data available.

Telemedicine is an effective case study secondly because of its resemblance to Law's (2002) own case study of the TSR-2 aircraft used to articulate the pinboard method. Both are historical cases necessitating documentary and archival research. Both cases are strongly related to science and technology. And both cases are similar in terms of their development, being controversial, politically significant (for a time) and eventually suffering decline.

These similarities are beneficial because they facilitate a close replication of Law's methodological practices. Since both cases draw from the same kind of data (i.e. historical documents) there is no need to rework Law's method in accordance with data of different kinds. Likewise, because of similarities in the development of both cases, it is relatively easy to find good examples with which to illustrate some of Law's more specific applications of the pinboard method. In particular, Chapter 6 tackles the question of telemedicine's decline in the late 1970s which parallels Law's own confrontation with the question of the TSR-2's cancellation. Following Law, however, in Chapter 6 the question is inverted to ask not 'why did telemedicine fail?' but instead 'how did telemedicine hold together for as long as it did?'

The Thesis: An Overview

Chapter 1 provides an overview of the pinboard method, explicating its theoretical and conceptual background and defining it through three principles of practice. The Chapter traces the pinboard to the emergence of Science and Technology Studies (STS) and Actor-

Network Theory (ANT) in the 1970s and '80s which together produced the basic ontological premises of the pinboard discussed in brief above. It then outlines a number of critiques and challenges directed at ANT in the early/mid '90s which, along with ANT scholars' own reflexions, resulted in a renewed *post*-ANT. Following this, the Chapter explicates a number of post-ANT's core concepts which serve as the bedrock upon which the pinboard method is founded. Then, finally, the scant literature on the pinboard method itself is discussed to produce a working guideline for its implementation in practice.

Following this, Chapter 2 explicates the methods and practices used to produce this thesis. It begins by defining a set of principles for methodological research based upon an examination of the development of Grounded Theory (Glaser and Strauss, 1967) and Qualitative Comparative Analysis (Ragin, 1987). These three principles – exemplification, comparison and reflexion – are used throughout the remainder of the thesis as a means of working through the pinboard method. Following this, the Chapter briefly outlines telemedicine as an empirical focus and how it is used in the case studies presented in Chapters 4, 5 and 6. Finally, the Chapter presents a reflexive account of how the thesis was produced, focusing on the actual practices of the research rather than a discussion of methodological principles.

Chapter 3 is the first of four analytical chapters. Here, a pinboard account of early telemedicine's *histories* is presented so as to set them up as a point of comparison for the pinboard accounts presented in Chapters 4, 5 and 6. At the same time, the Chapter offers a series of reflexions on the pinboard grounded in the fact that this Chapter was the first of the four pinboard Chapters to be written. Hence, at the same time as outlining the heterogeneity and diversity of histories of early telemedicine, it also identifies some methodological missteps which were made when producing the analysis.

In Chapter 4, attention is turned to early US telemedicine itself using the pinboard method to present a descriptive overview of US telemedicine in the 1960s and '70s. Developed in a manner similar to the discussion of the MGH-LAMS television system above, it works through a large number of exhibits derived from contemporary sources to demonstrate a wide variety of different enactments of early US telemedicine. In the conclusion, this analysis of early US telemedicine is compared with those other histories of early US telemedicine outlined in Chapter 3. It is concluded that while the pinboard account does not say much that is new about early telemedicine in comparison to the totality of those other histories, it nevertheless decentres the 'standard' account of early US telemedicine by emphasising enactments which are peripheral to this body of literature.

In contrast to Chapter 4, the pinboard presented in Chapter 5 possesses a much narrower scope, focusing on a specific instance of telemedicine established in Nebraska in the 1955. In this Chapter, two pinboards are presented, one outlining the early CCTV system that was established at the Nebraska Psychiatric Institute (NPI) and another outlining the politics of mental healthcare in Nebraska in the 1940s and '50s. In doing this, it is demonstrated that the NPI CCTV system and the community mental healthcare (CMH) movement were entwined with and performed one another in a variety of different ways. In the conclusion, the argument developed in the Chapter is contrasted with arguments developed in other histories of early telemedicine which purport to explain its emergence. While some similarities are drawn out, it is argued that the pinbaord account presented in the Chapter nevertheless develops a more complex account by explicating not only the context of the NPI CCTV system but also the ways in which that context was deployed and embedded within that system.

Chapter 6 shifts emphasis again, this time with regards to method. While Chapters 3, 4 and 5 all work through exhibits as the focus of discussion, Chapter 6 produces a pinboard of short narrative accounts instead. These are deployed in order to demonstrate many of the ways in which early US telemedicine was held together during the early 1970s. Hence, it is developed as a counter to narratives of early telemedicine which focus on explaining telemedicine's failure and decline in the mid-late 1970s. In the conclusion, the pinboard is again contrasted with existing histories of early telemedicine to demonstrate how it produces a complex and non-linear explanation for early US telemedicine's brief existence.

Then, in Chapter 7, the thesis is concluded. It begins by offering a summary of the previous chapters before presenting two discussions. In the first, the pinboards presented in Chapters 3-6 are related back to the three principles of the pinboard outlined in Chapter 1 so as to demonstrate how they were made manifest in practice. In doing so, it is concluded that the method proceeds similarly to the standard practices of coding used in other forms of qualitative data analysis but without the reduction of these codes to a set of themes or categories.. Following this, in the second section an evaluation of the pinboard is presented focusing on the extent to which it can perform complexity and avoid reduction. It is concluded that while the pinboard is an effective method for performing certain kinds of complexity, it nevertheless cannot escape the performance of reduction both practically and conceptually.

Chapter 1

The Pinboard: History and Context

This Chapter is concerned with explicating the pinboard method. It does this firstly through a description of its intellectual history and secondly through an outline of its core principles and features derived from Law's (2002; 2006) own articulations.

The pinboard method derives its core metaphysical concerns from research grounded in the field of 'Science and Technology Studies' (STS) and more specifically from a version of STS known as 'Actor-Network Theory' (ANT). Accordingly, the first part of the Chapter presents an overview of the emergence of STS and ANT, while the second part traces the developments in ANT which led to the formulation of the pinboard method.

Following this, in the third and final part of the chapter the pinboard method itself is outlined. The focus here is on two texts: Law's (2002) *Aircraft Stories* and a later article in which Law (2006) demonstrates the pinboard as an analytical method. Drawing from Law's illustrations of the pinboard in practice, this final section concludes with a set of principles and practices which define the pinboard method and which are the focus of examination in the remainder of the thesis.

Science and Technology Studies and the Emergence of Actor-Network Theory

Actor-Network Theory (ANT) is a methodological approach to social science which has gained increasing traction over the last decade and a half. Originating in the 1980s within the field of Science and Technology Studies (STS), ANT has come to colonise social scientific practice more generally, finding homes in Sociology (e.g. Gomart and Hennion, 1999; Murdoch, 2001; Savage, 2009; 2013), Anthropology (e.g. Openheim, 2007; Tsing, 2010), Business and Organisation Studies (e.g. Czarniawska and Hernes, 2005), Education Studies (e.g. Law, 2006; Mulcahy, 2011) and elsewhere. In spite of its proliferation, however, ANT is not easily

explicated as it has been deployed in a variety of different ways. Czarniawska and Hernes (2005: 9) write that:

> "Actor-network theory has been variously interpreted as 'actors and their networks', 'actor's networks', and sometimes, as with 'grounded theory' in the 1980s, it has been attached to whatever approach the author happened to favour at the point of writing the text."

But while Czarniawska and Hernes imply that the heterogeneity of ANT has resulted from misreading or misinterpretation, a more significant source of heterogeneity stems from its own transformations and developments. While ANT emerged in the early 1980s, it was not until the beginning of the 1990s that it had become an explicit, established and identifiable approach to STS (Law, 2009). Since then, ANT has only continued to transform as its proponents engaged with a variety of challenges and critiques (e.g. Haraway, 1997; Lee and Brown, 1994; Star, 1991). Hence, by the end of the 1990s the key proponents of ANT had become some of its fiercest critics (e.g. Callon and Law, 1995; Law and Hassard, 1999). While continuing to work with many of ANT's original ideas and concepts, ANT scholars have thus also striven to explore and develop a variety of new themes and concerns in a body of work typically referred to as 'post-ANT'.

The pinboard method constitutes one version of this so-called 'post-ANT' scholarship. Hence, with a view to contextualising the pinboard method and distinguishing it from other versions of post-ANT, the following two sections present an overview of early ANT, its critics and its subsequent transformations. To this end, the current section begins with a brief overview of early STS and continues with a description of the core features of ANT in the 1980s. Then, in the following section, the various criticisms of early ANT are outlined and discussed with a view to demonstrating the emergence of post-ANT.

Reflexions: *The Literature Multiple*

In her work on lower-limb arthrosclerosis, Mol (2002) raises the following issue:

> "Generalizations about 'the literature' always draw together disparate writings that have different souls, different concerns of their own… If I take so much trouble to point out the multiplicity of medicine while I refer to sociology, anthropology, history or philosophy in general terms, this might suggest that *they* possess the unity which medicine does not. But they don't." (Mol, 2002: 6)

Mol's argument, in short, is that academic literature is fractional, too. On the one hand, 'the literature' is disparate, diffuse, heterogeneous and non-coherent. But on the other hand, it may be rendered coherent through practices – such as the literature review – which perform it. Like narrative, then, the literature review erases complexity and heterogeneity in the production of a coherent and stable account. It is never simply a description of 'the literature' but a performance – one which might have been done otherwise (see also Law, 2008; 2009).

Mol treats this issue as problematic and her solution is novel: splitting her text literally in two, she dedicates one half to her empirical work and the other to her discussion of literature. In doing this, Mol frees herself from the necessity of tying things together within a single section or chapter. Instead, she is able to construct a complex account, with the themes, concepts and ideas permitted to drift from chapter-to-chapter and even page-to-page. Her text is 'fluid' (Mol and Law, 1994; de Leat and Mol, 2000): it works differently in different places; and it works precisely because it works differently in different places.

Much of this literature review focuses upon the field of Science and Technology Studies and more specifically upon one version of STS, Actor-Network Theory. Both are complex, heterogeneous and non-coherent (see main text). Like Mol, then, I am confronted with the problem of fractional literature and, like Mol, my impulse is to describe rather than erase complexity through a non-standard review of it.

Mol's solution, however, is too risky to be deployed here given that it would involve a significant departure from the standard format of a PhD thesis. An alternative would have been to write a pinboard account of the literature. But again, this is not the approach I have taken. It was trialled, but the account never adequately performed the complexity and diversity of that literature it pertained to. In part, this was a consequence of resources: there was never enough time and never enough words to be spared. But more significantly, it was a consequence of the near-endless versions of 'the literature' which could be enacted. And even if 'the literature' could be enacted as complex and non-coherent, what of the texts which constituted that literature? For a text, too, is complex: it does not exist in and of itself but in relation to other texts, concepts and matters of concern.

Attempting to capture the complexity of the literature, then, was an ever expanding task. More could always be written. On this, Marilyn Strathern is instructive:

> "If diverse elements make up a description, they seem as extensible or involuted as the analysis is extensible or involuted. Analysis appears able to take into account, and thus create, any number of new forms. And one can always discover new networks within networks; this is the fractal logic that renders any length a multiple of other lengths, or a link in a chain a chain of further links. Yet analysis, like interpretation, must have a point; *it must be enacted as a stopping place*" (Strathern, 1996: 523; emphasis added)

Strathern's final point is, perhaps, obvious. Nevertheless, it is (and was!) easily forgotten when dealing with issues of complexity and non-coherence. Concerned to distraction about the erasure performed by 'stopping', I had neglected 'stopping' as a practical necessity. And it was only through my failure to produce an adequately complex account that I reclaimed an appreciation of this.

I agree, then, with Mol's argument: 'the literature' is fractional. But I do not agree that this necessarily requires 'the literature' to be performed as such. While it may be appropriate to do so, it may also not be. It is a contingent matter and, here, a brief historical and intellectual narrative leading towards the emergence of the pinboard method is suitable enough.

A New Sociology of Science

Shapin (1995: 294) describes eminent sociologist Robert K. Merton as the "founding father of the sociology of science". Striving to establish "the study of science as a legitimate branch of structural-functionalist sociology" (ibid.), Merton's work examined the causes, structure and functions of science and scientific practice. In his doctoral thesis, for example, Merton (1938) examined how science developed as an institution in 17th century England, while in other essays he explored the normative structure of science and the methods by which this normative structure is enforced and maintained (Merton, 1973). This early sociology of science, however, precluded the study of scientific practice and the study of knowledge itself. Scientific practice was understood – simply – as the product of properly applied scientific method, while method in turn was similarly understood as a product of epistemology. Accordingly, there were no questions to be answered concerning scientific practice or knowledge.

The 1970s, however, saw the emergence of a new sociology of science which departed more-or-less radically from the principles and concerns established in Merton's work. Refusing the reduction of scientific practice to epistemology, this new sociology of science sought to explore the relationship between scientific knowledge and the contexts within which it is produced (Moreira, 2010). This was not an entirely new proposition: the notion of a relationship between science, technology and society had existed since at least the beginning of the 20th century (Harré, 1981: vii). Nevertheless, the new sociology of science transformed that notion into an entire field of social scientific research.

The new sociology of science took a variety of different forms. The first of these, commonly referred to as the 'Strong Programme' or 'Edinburgh School', sought to explain scientific knowledge as a product of social factors. The central premise of the Strong Program was the idea that social factors, rather than 'contaminating' what would otherwise be 'pure' science, in fact thoroughly constitute the practice of science:

> "The resources of sociology (and contextual history) were, it was said, necessary to understand what it was for scientists to behave 'logically' or 'rationally', how it was that scientists came to recognize something as a 'fact' or as 'evidence' for or against some theory, how, indeed, the very idea of scientific knowledge was constituted, given the diversity of practices claiming to speak for nature" (Shapin, 1995: 297)

Central to the Strong Programme, therefore, was the so-called 'principle of symmetry' which asserted that "the same types of cause should explain both (perceived) true and false knowledge" (Woolgar, 1981: 366). MacKenzie (1978) demonstrates this principle clearly in his study examining Yule's and Pearson's theories of association between nominal variables. While Pearson's approach eventually proved successful, MacKenzie explains the approaches of *both* scholars by recourse to their respective 'cognitive interests'. Pearson, it is argued, was strongly influenced by his previous success developing a theory of interval-level association and sought to develop a theory which would replicate the tightness and specificity of this previous work. In contrast, Yule was interested in a looser approach which could be used as a general measure of association and which could be elaborated further in specific situations where necessary. To explain these differences, MacKenzie argues that Yule and Pearson possessed different interests grounded in the kinds of research they were engaged in. While Pearson's work was strongly related to eugenics, Yule lacked any specific research commitments. Hence, Pearson is argued to have designed a tool that was influenced by, and appropriate for, the specific requirements of eugenics research while Yule developed a tool without any kind of specificity. MacKenzie, therefore, explains both Yule's

and Pearson's methods by recourse to their respective interests, despite the eventual success of Pearson's method and the failure of Yule's.

While the Edinburgh School was concerned with explaining scientific knowledge in terms of social forces and – in particular – social interests, a second version of the new sociology of science focused instead on the ways in which scientific controversies played out and were resolved. Central to this 'social constructivist' approach was the idea that "the natural world has a small or non-existent role in the construction of scientific knowledge" (Collins, 1981a: 3). Instead, scientific knowledge was understood as a consequence of discourse, negotiation and argument between scientists and that scientific knowledge was – in the final analysis – a matter of convention:

> "To press the account forward requires that it be taken that the phenomenon itself does not dictate the outcome of the debate, otherwise the failure of the defeated party – the incredibility of the discredited phenomenon – will seem so natural as not to require an explanation at all. The appropriate attitude for conducting this kind of inquiry is to assume that 'the natural world in no way constrains what is believed to be'" (Collins, 1981b: 54)

This so-called 'empirical programme of relativism' (Collins, 1981a) therefore focused on describing the way in which phenomena were variously interpreted and contested within the context of scientific work. Woolgar (1981: 389) outlines a number of questions central to this version of science studies:

> "[W]hat counts as legitimate avoidance of what might otherwise be regarded as insurmountable philosophical difficulties? How are presentational devices used to minimize the possibility of critical interventions by others? What argumentative strategies enable scientists routinely to accomplish and sustain the 'rationality' of their interpretations in the face of the ever-present possibility of 'better' alternative interpretations?"

Thus, for example, Pickering (1981) examines the various arguments and counter-arguments made during a dispute around the 'discovery' of the magnetic monopole. Opening with an account describing how scientists interpreted their data as evidence for the existence of naturally occurring magnetic monopoles, Pickering then describes how alternative interpretations of that data contested the initial conclusion drawn. In doing so, Pickering demonstrates how a wide variety of different interpretations could arise from the same piece of data. Similarly, Collins (1981b) examines a controversy concerning the (non-)discovery of gravitational radiation. In his paper, Collins describes how scientists possessed a variety of

wide-ranging interpretations of evidence linked to the controversy. Some scientists, for example, were highly critical of the studies claiming to have detected instances of gravitational radiation, highlighting their various flaws and problems. Others were more ambivalent towards these faults, or did not consider them to be problematic. The same range of interpretations related to studies evidencing an inability to measure gravitational radiation. Out of this range of different positions and interpretations, then, Collins argues that the controversy was closed not because of a definitive study or piece of evidence, but because of a rhetorically persuasive paper which proved to be highly convincing in spite of its own (alleged) failings.

Other social constructivist studies of science, however, focused on the everyday practices of laboratory scientists rather than on the resolution of 'public' scientific controversies. Through ethnographic observations of laboratory science (e.g. Knorr-Cetina, 1981; Latour and Woolgar, 1987; Lynch 1985; Lynch et al, 1983) it was argued that interpretation, negotiation and argument were at the heart of day-to-day scientific work. Lynch (1985), for example, describes a variety of situations in which scientists used informal and practical reasoning to resolve issues on the laboratory floor. Artifactual anomalies in experimental data are described as being both identified and resolved through tacit and informal practices rather than on the basis of formal methodological rules or procedures. Similarly, Lynch describes how truth claims are asserted, challenged and reconfigured in everyday 'shop talk', again without recourse to explicit rules or methods. In a similar vein, Knorr-Cetina (1981) describes how scientists used a variety of situated modes of reasoning in their practice. For example, she describes how scientists deployed an 'indexical' mode of reasoning in their everyday practice in contrast to the 'decontextualised' accounts of research in scientific publications. In other elements of their practice, however, scientists deployed a broadly economic mode of reasoning, and so on. In various ways, then, these studies describe the techniques and practices used by scientists to negotiate and produce truth claims.

Actor-Network Theory

Actor-Network Theory emerged in the early 1980s as a further alternative to the social study of science. In common with constructivist versions of science studies, ANT was concerned with how the processes and practices of science produce scientific knowledge. Unlike constructivist studies, however, ANT was concerned not only with the discursive practices of science but the material and technical practices of science as well. Scientists, it was argued, do not simply observe or interpret nature, but *transform* nature through various devices and techniques in order to produce those observations and interpretations. In order to explain

the production of scientific knowledge, then, ANT contended that one must follow the materials, methods and practices of science in action along with its rhetoric.

Accordingly, ANT conceptualised scientific knowledge as:

> "the end product of a lot of hard work in which heterogeneous bits and pieces -- test tubes, reagents, organisms, skilled hands, scanning electron microscopes, radiation monitors, other scientists, articles, computer terminals, and all the rest -- that would like to make off on their own are juxtaposed into a patterned network which overcomes their resistance" (Law, 1992: 2)

Latour's (1981; 1988a) case study of Pasteur's creation of a vaccine for anthrax is a widely cited exemplar. In his account, Latour describes how the material setting of Pasteur's laboratory allowed Pasteur and his colleagues to render anthrax visible, to produce a vaccine for it, and to demonstrate the efficacy of that vaccine to the French public. In situ, anthrax was unknowable. Most basically, it was invisible to the human eye. But it was also unpredictable, often remaining dormant for years before emerging with no obvious patterns or causes. In Pasteur's laboratory, however, it was separated from the complexities of its agricultural context. Through microscopy, it was possible to see the anthrax bacillus. Through cultivation and experimentation, it was rendered predictable. Hence, it was only through the material setting of the laboratory that Pasteur and his fellows were able to develop a vaccine for the disease.

In accordance with this emphasis on the materiality of science, ANT studies deployed a broad conceptualisation of agency which refused inherent distinctions between humans and non-humans. The term 'actor' – or, often, 'actant' (e.g. Latour, 1996) – was therefore used to refer to *any* entity – human or non-human – involved in the production of scientific knowledge:

> "[An actor is] *any element* which bends space around itself, makes other elements dependent upon itself and translates their will into a language of its own. An actor makes changes in the set of elements and concepts habitually used to describe the social and the natural worlds. By stating what belongs to the past, and of what the future consists, by defining what comes before and what comes after, by building up balance sheets, by drawing up chronologies, it imposes its own space and time. It defines space and its organization, sizes and their measures, values and standards, the stakes and rules of the game – the very existence of the game. Or else it allows another, more powerful than itself, to lay them down" (Callon and Latour, 1981: 286; emphasis added)

Returning to Latour's study of Pasteur, then, Pasteur himself features as a prominent actor. Pasteur visited farms plagued with anthrax; took samples and brought them back to his laboratory; performed public demonstrations of his vaccine; and so on. But the materials of the laboratory also feature as actors in Latour's account. Microscopes, for example, magnified the anthrax bacillus such that it was rendered visible to Pasteur and his colleagues, while a nutrient solution fed the laboratory-bound anthrax samples and therefore enabled their cultivation within the laboratory. Anthrax itself features as an actor, too. Killing livestock; evading detection; defying prediction: it was all these characteristics which Pasteur worked to undo through his work.

The quotation from Callon and Latour above, however, also demonstrates a second way in which ANT emphasised the material. Rather than producing only representations of reality, Callon and Latour suggest that actors *transform* and thereby produce *new* realities as well. Scientific practice, then, was conceptualised as a process whereby realities are manipulated, changed and altered – in ANT parlance, "translated" – rather than simply 'described' or 'discovered':

> "Specific to this laboratory is the particular configurations of apparatus that we have called inscription devices. The central importance of this material arrangement is that none of the phenomena 'about which' participants talk could exist without it. Without the bioassay, for example, a substance could not be said to exist. The bioassay is not merely a means of obtaining some independently entity; *the bioassay constitutes the construction of the substance*" (Latour and Woolgar, 1987: 64; emphasis added)

In making this argument, Latour and Woolgar mean two things simultaneously. On the one hand – to draw upon their example – performing a bioassay entails a chain of physical transformations (Latour and Woolgar, 1987: 47-48). Rats must be injected with various liquids; must be slaughtered; and must have relevant tissues removed and processed in test tubes. Following this, the samples are processed further through a machine which produces, at the end, a sheet of figures. At each stage, reality has been transformed: a rat becomes an injected rat; an injected rat becomes a dead rat; a tissue sample is produced from the rat; and finally that sample is transformed into a set of figures for analysis. The substance, then, is an end product of a long chain of transformations rather than something which was there all along.

On the other hand, however, Latour and Woolgar are also asserting that the substance produced by these transformations is not an independent entity but in fact embedded within a web of relations which constitute it. The substance and the methods by which it was

produced come together as a package, with the substance only having form in relation to those methods. In others words, Latour and Woolgar are advancing a semiotic conceptualisation of reality whereby things exist only as parts of networks of association.

In relation to this, Latour's account of Pasteur is once more instructive. On the one hand, Pasteur is described as having 'discovered' the anthrax bacillus through a series of transformations. In order to render it knowable, Pasteur has to relocate the disease from the fields of France to his laboratory. In doing so, he produces a new version of anthrax – 'in-the-laboratory' – which hitherto did not exist. But too, it was necessary to cultivate and therefore domesticate the disease so that it could be examined and experimented with. Through the microscope, the disease was transformed once again, from invisible to visible. Through all of this, then, Pasteur was able to transform a mysterious and unknown disease into the visible, known and predictable anthrax bacillus. In other words, Pasteur was able to reconstitute this small element of reality.

In ANT, then, scientific practice was understood as producing not only representations of reality but realities themselves as well. But at the same time as conceptualising actors as the producers of natural and social order, so actors themselves were understood as an effect or outcome of practice. The actor, in other words, was not conceptualised as a discrete entity but as a network of associations (hence the term 'Actor-Network'). Thus, for example, a scientist according to ANT does not work alone: she works with colleagues, tools, materials, skills and knowledge, all of which together form a network constituting her as a scientist. And accordingly, ANT conceptualised agency as distributed across such networks and as irreducible to any single component (Latour, 1988; 2005).

A major concern of ANT, therefore, was to examine the methods and practices by which such networks are produced and maintained. Through the notion of 'enrolment', ANT studies explored the way in which disparate elements were aligned to construct stable networks of associations (see for example Callon, 1986; Callon and Law, 1982; Latour, 1981; 1988). Returning one final time to Latour's work on Pasteur, his analysis is focused especially on the ways in which Pasteur went about producing a complex network constituted by anthrax, his laboratory, the French government, agriculturalists, and the public. At each step, Latour describes Pasteur as having increased the size of the network which constituted him. By bringing anthrax into the laboratory, cultivating it, and therefore making it orderly and predictable, Pasteur is said to have enrolled the disease into his network. Through experimentation and trials, Pasteur was able to carry out public demonstrations showcasing his mastery over the disease and convincing both the French government and public of his

explanations. So too, then, were the French government and public enrolled, affording the Pasteurian network the capacity to distribute its vaccinations – along with the specific conditions required for them to work – across the entirety of France. Hence, through all this, Pasteur is described as having grown to such a size that he was able to transform all of French society. Only 'Pasteur', here, means not 'Pasteur, the man' but instead 'Pasteur, the great scientist' accompanied by a whole network of actors which constituted him as such through their enrolment.

The final point to be made about ANT, therefore, is that it abandoned the taken-for-granted distinction between social structures and individual agency. Actors may be large or small – 'micro' or 'macro' – but again this was understood as an outcome rather than as something pre-given:

> "*There are* of course micro-actors and macro-actors, but the difference between them is brought about by power relations and the construction of networks that will *elude* analysis if we presume *a priori* that macro-actors are bigger than or superior to micro-actors. These power relations and translation processes reappear more clearly if we… [assume] that all actors are isomorphic. Isomorphic does not mean that all actors have the *same* size but that *a priori* there is no way to decide the size since it is the consequence of a long struggle. The best way to understand this is to consider actors as networks" (Callon and Latour, 1981: 280; original emphasis)

In summary, then, the implications of ANT were wide-reaching. Not only did ANT work material reality back into STS but in doing so it also challenged and reworked many of the taken-for-granted assumptions of conventional social science. Through its non-essentialist, semiotic ontology it refused inherent distinctions not only between 'humans' and 'non-humans' but also 'society' and 'nature' and 'micro' and 'macro'. Rendering these distinctions as effects or outcomes of practice, ANT transformed the many resources of social scientific explanation into topics of enquiry instead.

Towards Post-ANT

While ANT constitutes the foundation for the pinboard method, the concerns of early ANT research differed markedly from those issues that the pinboard is designed to address. Early ANT was focused primarily on describing the methods and practices by which realities were brought into being. As already outlined above, Latour's (1988) *Pasteurization of France* was focused upon describing the methods and practices employed by Pasteur which enabled him to know, master, and eventually defeat the anthrax bacillus. Callon's (1986) study of scallop

fishing similarly focused upon the (unsuccessful) efforts made by scientists to domesticate scallops and therefore produce a stable system within which they could be farmed as a renewable resource. Law (1987) describes how a vast array of different actors: ships, navigational technologies, winds, currents, sailors, guns, and much more together constituted a durable network of Portuguese naval supremacy in the 15th and 16th centuries. And so on. In contrast, however, the pinboard method is concerned with the ways in which realities do *not* cohere, *resist* assembly, and otherwise remain only *partially connected*. Hence, while it draws from ANT it nevertheless works towards addressing quite different questions.

The issues with which the pinboard method is concerned did not, therefore, arise inherently out of the metaphysics of early ANT. Instead, they emerged gradually over the course of the 1990s as ANT scholars and sympathetic critics attempted to tease out and reconcile various problems with ANT and its deployment. Together, these transformations produced what has sometimes been referred to as 'post-ANT' which is grounded in the metaphysics of ANT but which carries them in a variety of different directions.

Critiques of Actor-Network Theory

"Actor-Network Theory… [trod] on a set of ethical, epistemological and ontological toes" (Law, 1992: 3), which unsurprisingly led to extensive critique. Amsterdamska's (1990) review of *Science in Action* (Latour, 1987) rejected its ontological premises as absurd and its sociological vision valueless. Collins and Yearley (1992a; 1992b) argued that ANT was reactionary and backward-looking through its reinsertion of nature into the resolution of scientific controversies, thereby reproducing a version of pre-1970s sociology of science. Years later, Bloor (1999) argued that ANT adds nothing when compared with Edinburgh School studies of science and technology and therefore is nothing but a poor substitute for his own version of science studies. These quarrels, however, were overwhelmingly concerned with the metaphysics of ANT (Law, 2009). Hence, while these criticisms and the responses to them (e.g. Callon and Latour, 1992; Latour, 1999) helped clarify key points of contention, they contributed little to the development of ANT scholarship.

This said, a second group of critiques expressed sympathy for the ontological premises of ANT and directed their criticism instead towards the way in which these premises had been deployed in practice. In one way or another, then, these critiques worked towards producing scholarship which fully exploited ANT's ontological underpinnings. The first of these, Star (1991), criticised ANT studies for their excessive focus on actors at the centre of network-

building processes while largely ignoring those at the periphery. "We know," wrote Star (1991: 33),

> "how to discuss the process of translation from the point of view of the scientist, but much less from that of the laboratory technician, still less from that of the lab's janitor, much as we agree in principle that all points of view are important."

Star's point, then, is that processes of network building are not the same for all the actors involved in the process of production. The realities of network-building are multiple. Some actors enrol; others are enrolled. Some actors delegate; others are delegated to. Some actors become larger and more powerful; others become smaller and less powerful. And so on. Star's criticism, then, was that ANT studies tended to focus on the actors who grew size and power while the realities of those enrolled or reduced were overlooked.

In addition to this, Star also argued that processes of network-building were always more or less partial and incomplete:

> "A stabilized network is only stable for some, and that is for those who are members of the community of practice who form/use/maintain it. And part of the public stability of a standardised network often involves the private suffering of those who are not standard – who must use the standard network, but who are also non-members of the community of practice" (Star, 1991: 43)

Like the process of reality-building, Star argues here that the stability and coherence of realities is itself relative. Using herself as an example, Star describes how her allergy to onions served to undo the coherence and stability of fast-food restaurants which she found were entirely incapable of adjusting to her requests for food without onions. While these restaurants were therefore efficient and effective at dealing with 'regular' customers, for 'irregular' customers they proved to be at best a chore. In general, then, Star argued that while some actors may be subsumed or enrolled within a particular reality, others ("*Others*") may yet remain outside or peripheral to it. And again, it was Star's argument that ANT studies overlooked those actors who were – in one way or another – excluded, marginalised or made peripheral by reality-building practices.

Lee and Brown's (1994) critique of ANT articulated a similar concern for the realities which ANT failed to engage with. Through its anti-essentialism, they argued, ANT risked becoming a totalising discourse which claimed to speak for everything:

> "Having converted the world into a play of forces, [ANT] has no way of circumventing the formulaic circle of expansion, domination and collapse. ANT has achieved a

> metalinguistic formulation – inscribed as problematization, interessment, enrollment, mobilization and dissonance... – into which any sequence of human or nonhuman actions can be encoded. This amounts to a foreclosure on all alternative descriptions of the world through the assertion of total democracy and complete ontological monadism" (Lee and Brown, 1994: 781)

Drawing heavily from Deleuze and Guattari (1988), however, Lee and Brown argued that this implicit conviction was misplaced. While conceding that ANT studies had effectively examined the ways in which "striated" spaces of hierarchy and order were produced, it was contended that ANT studies nevertheless failed to grasp "smooth", "rhizomic" space lacking order or centre (pp. 784-785). ANT's "*final* final vocabulary" (pp. 783) was therefore no such thing: it possessed the ability to perform certain kinds of realities – those which were ordered and coherent – but not others, with the result that these others were implicitly erased.

Haraway's (1997) critique of ANT was similarly concerned with the all-encompassing nature of ANT accounts:

> "[F]rom the point of view of some of the best work in mainstream science studies of the late 1980s, 'nature' is multiply the feat of the hero... First, nature is materialized fantasy, a projection whose solidity is guaranteed by the self-invisible representor. Unmasking this figure, [the science studies scholar] who would not be hoodwinked by the claims of philosophical realism and the ideologies of disembodied scientific objectivity fears to 'go back' to nature, which was never anything but a projection in the first place... Then, another kind of nature is the result of trials of strength, also the fruit of the hero's action. Finally, the [science studies] scholar too must work as a warrior, testing the strength of foes and forging bonds among allies, human and nonhuman, just as the scientist-hero does. The self-contained quality of all this is stunning. It is the self-contained power of the culture of no culture itself, where all the world is in the sacred image of the Same. This narrative structure is at the heart of the potent modern story of European autochthony" (Haraway, 1997: 35)

For Haraway, however, the overarching narrative of ANT studies was problematic not only because of its scope but because of its *politics*. In drawing upon and performing familiar tropes of war, heroism and triumph, ANT accounts worked to replicate, perform and therefore maintain existing versions of reality along with all their inequalities. Hence, ANT was rendered problematic firstly because it worked to erase differences by rendering all things the same; and secondly because its rendering lacked any critical orientation towards the taken-for-granted narratives of Euro-American societies.

A common theme in all these critiques was the argument that, in one way or another, ANT studies had failed to engage with and explore the issue of difference. In Star's critique, ANT studies were understood to have focused on the ways in which standardisation, homogeneity and sameness were produced without also examining the ways in which differences might be performed and maintained. Similarly, the critiques developed by Lee and Brown and also Haraway challenged the propensity for ANT studies' to erase differences as a result of their accounting for all things in precisely the same manner.

These arguments proved to be effective. In his contribution to *Actor Network Theory and After* (Law and Hassard, 1999), John Law wrote that:

> "Actor-network is, has been, a semiotic machine for waging war on essential differences. It has insisted on the performative character of relations and the objects constituted in those relations. It has insisted on the possibility, at least in principle, that they might be otherwise...
>
> "But the problem is this: it [ANT] has been incredibly successful... to the point where *its own topological assumptions have been naturalized*. Which, if you take the position that I'm pressing, has the effect of limiting the conditions of spatial and relational possibility. And, in particular, of *tending to homogenize them*" (Law, 1999: 7-8; original emphasis)

In this quotation, Law concedes the point made by ANT's critics. On the one hand, he describes ANT as having opened up ontology through the erasure of essential differences, with the result that ANT had been well-poised to examine the ways in which realities were constructed and performed through practice. On the other hand, however, he describes ANT as having become precisely the thing it was intended to oppose: a standardised, stable package of metaphysical assumptions blotting out all alternatives. Hence, as Law (1999: 8) went on to assert, ANT had "lost the capacity to apprehend complexity" through its reduction of reality to a specific and defined conceptual schema. Latour, in the same volume, made a similar point:

> "a great deal of our own vocabulary has contaminated our ability to let the actors build their own space... This weakness on our part does not mean, however, that our vocabulary was too poor, but that, on the contrary, it was not poor enough" (Latour, 1999: 20)

The critiques of ANT written by Lee and Brown, Star and Haraway therefore proved to be highly significant with regards to transformation of ANT. Leaving its basic metaphysical assumptions intact, these critiques worked instead to refocus attention on production and

maintenance of difference and disorder. These themes would become some of the hallmarks of post-ANT scholarship are highly important with regards to the pinboard method.

After ANT

While critiques of ANT took issue with the way in which ANT had been deployed in practice, ANT scholars themselves had also become dissatisfied with their work. Callon and Latour (1992: 344) express this clearly in their response to the criticisms of Collins and Yearley (1992a; 1992b). More implicitly, Latour (1999: 115) takes great delight in describing himself and his work as a "moving target" in his response to Bloor's extensive critique (1999). As such, even while the critiques outlined above were being written, ANT scholars were (in collaboration with others) already in the process of reassessing, expanding upon and developing the ideas and concepts that had emerged from early ANT.

Law's *Organizing Modernity* (1994) is one example of this transitional work. Like many other examples of ANT research, it is an ethnographic study of science in practice. It is not, however, concerned with the ways in which scientists produced this or that fact or truth. Instead, it is concerned with the ways in which scientists in the laboratory went about structuring and organising the institution within which they worked. The central concern of the text, then, is to demonstrate the ways in which the scientists he worked with made sense of – and therefore also made – social order. In doing so, Law articulates the production of order as a continuous and always-incomplete *process* rather than a project possessing a discrete end-point:

> "In response to this question [what on earth is social order?] I find that I have to refuse its terms. Thus as I see it, first the notion of order goes. Perhaps there is order*ing*, but there is certainly no ord*er*. This is because… orders are never complete. Instead they are more or less precarious and partial accomplishments which may be overturned…
>
> "Second, the idea that there is a *single* order… goes. This is the dream, or nightmare, of modernity. But there never was a root order, so we have to replace this aspiration by a concern with plural and incomplete processes of social ordering" (Law, 1994: 1-2; original emphasis)

While Law's position draws upon the anti-foundationalism of ANT, it also transforms ANT by shifting from a notion of construction to a notion of performance. On the one hand, it is Law's contention that 'social order' is not something pre-given but instead something produced. On the other hand, however, through his contention that orders "are never complete", Law resists the assumption made by earlier ANT studies that realities, once

produced, become fixed and stable. Instead, Law's assertion is that realities are stable only in so far as they are reproduced and maintained through practice. Hence, ordering is an ongoing process without a final end-point.

As well as shifting towards a vocabulary of performance, however, Law also moves towards a vocabulary of *multiplicity*. There are, he argues, a multitude of *different* orders which are performed within the laboratory and much of Law's empirical work revolves around describing these orders. In some instances, for example, the laboratory is performed in terms of 'enterprise': creating and pursuing opportunities; taking risks; and reversing failures. In others instances, it is performed instead in terms of 'administration': roles; responsibility; hierarchy; and procedure. In others still, it is about 'vision', a version of the laboratory which centres upon the insight, charisma and talent of key individuals. And yet another, 'vocation', is concerned with skill, proficiency, training and so on. None of these different 'modes of ordering', however, are described as ever being final nor are they described as constituting together a final description of the laboratory's structure. Instead, each is outlined simply as a different way of articulating, making sense of, and working within the context of the laboratory.

So while other ANT studies focused on the way in which this or that order was produced and stabilised, in *Organizing Modernity* Law examines instead how a variety of *different* orders were simultaneously produced and maintained. Law and Mol (1995) enact this same shift. Opening with an outline of ANT's material semiotic ontology, they deploy it only as a starting place. "Perhaps," they write, "it's best to think of semiotics as a way of clearing the ground... [A] way of helping us imagine that sociality and materiality go together... But where do we go next?" (Law and Mol, 1995: 280).

Answering that question takes Law and Mol towards a concern with multiplicity and difference. Realities, they argue, are produced at least in part by modes of ordering (though the word "strategies" is used here instead), with different modes of ordering producing different assemblages of reality. Accordingly, Law and Mol conceptualise the world as:

> "a kind of kaleidoscope in which materiality is continually being organised and reorganised. Perhaps at times these materialities compete. But this isn't necessarily the case, for a mix of strategies may be stronger than one alone" (Mol and Law, 1995: 286)

More or less, this is the same argument as Law in *Organizing Modernity.* But in the final part of their paper, Law and Mol (pp. 287) move on to ask: how is it that realities fit together, if indeed they do fit together at all? In positing an answer to that question, Law and Mol draw

upon Strathern's (1991) notion of 'partial connections' to produce the metaphor of a 'patchwork' which imagines:

> "[that] materials and social – and stories too – are like bits of cloth that have been sewn together… that there are many ways of sewing… [and] that there are many kinds of thread. It's to attend to the specifics of the sewing and the thread. It's to attend to the local links. And it's to remember that a heap of pieces of cloth can be turned into a whole variety of patchworks" (Law and Mol, 1995: 290)

This notion of a 'patchwork' is more or less foundational to Law's later notion of the pinboard. It is a conceptualisation of reality whereby bits and pieces may (or may not) be tied together in a variety of different ways; whereby these bits and pieces may (or may not) overlap to any great extent; and whereby these bits and pieces may come undone from one another and be reworked in new ways. It is precisely this kind of reality that Law's pinboard method is designed to address.

One of the moves made by post-ANT, then, is towards the notion of fractional coherence: multiple, partially connected realities which are made and remade through practice. The notion of fractionality turned attention to the ways in which realities are constantly being performed and the ways in which different realities fit – or fail to fit – together. This issue of 'fitting' is also the focus of Mol and Law's (1994) paper on the social topologies of anaemia. In this paper, Mol and Law outline various ways in which the topology of anaemia can be described. On the one hand, they describe anaemia in terms of a 'regional' topology. This topology defines anaemia in terms of its geography, its prevalence, its severity, and so on. On the other hand, they describe anaemia in terms of a 'network' topology. Grounded in ANT, this second topology demonstrates how anaemia exists in relation to the practices which perform it. In particular, they focus upon laboratory tests which serve as the principle mechanism by which anaemia is identified, diagnosed and therefore measured. Laboratory tests, therefore, help constitute the disease by performing it as variably located, prevalent and severe. Juxtaposed with these two topologies, however, is a third, 'fluid', space:

> "[T]he fluid metaphor suggests that we are dealing with something which is viscous: with things that tend to stick together. But it also points to a possible difference – a difference between fluid and network spaces. For in a network things that go together depend on one another. If you take one away, the consequences are likely to be disastrous. But in a fluid it isn't like that because there is no 'obligatory point of passage'; no place past which everything has to file; no panopticon; no centre of translation; which means *every* individual element may be superfluous" (Mol and Law, 1994: 661)

Mol and Law articulate this notion of 'fluidity' through a contrast between anaemia in the Netherlands and anaemia in Africa. While laboratory testing is central to diagnosis in the Netherlands, in Africa there is seldom the time or resources for laboratory testing. In Africa, then, the diagnosis of anaemia is contingent on a clinical assessment of symptoms and signs, primarily pallor of the skin and other parts of the body. But the crux of Mol and Law's argument is that these two sets of practices – anaemia-in-the-laboratory and anaemia-in-the-clinic – do not constitute two independent versions of the disease. For sometimes, the laboratory version is practiced in Africa, while the clinical version is performed the Netherlands. What is more, both the laboratory and clinical versions of anaemia may be performed with (or without) this or that element. Perhaps, the clinic is too busy: complaints and descriptions of symptoms become displaced and pallor of the eyelids takes centre-stage (pp. 656). Perhaps a Dutch physician travels to Africa to work. Though she is trained to work with anaemia-in-the-laboratory this is hardly possible in her new environment. So instead, she works to perform the unfamiliar anaemia-in-the-clinic, switching from one mode of anaemia to another.

The point that Mol and Law are making, then, is that anaemia is performed in a variety of different ways but none of its enactments, or the practices which produce them, are central to it. Anaemia is one thing here and another thing there yet – somehow – it holds together. On the one hand, this notion of fluidity is somewhat similar to the notion of fractionality outlined above. Both constitute descriptions of how things might be at the same time singular and multiple; coherent and non-coherent; stable and unstable. Both are metaphors for knowing complexity. But on the other hand, the metaphor of fluidity emphasises transience and freedom: if fractionally coherent realities are woven together in a patchwork, then fluid realities attach and detach more or less at will, with nothing durable binding them together.

These two notions – fluidity and fractionality – are not intended to compete with one another. As Law and Mol (1994) go on to argue, there is no presumption that these or the other topologies they outline are the only ways in which realities can be known and enacted:

> "A fluid space... isn't quite like a regional one... And a fluid space isn't quite like a network, either... But if we put it like this our story sounds rather regional. It sounds as if we're saying that there are sharp divisions between three types of space. And as if they were independent from one another. But this isn't right. Quite the contrary, in fact. Because the three topologies have *intricate relations*. They coexist" (Mol and Law, 1994: 663; original emphasis)

'Fluid' realities, then, are no more true or real than 'regional' or 'network' realities. Each of these terms refers to – and performs – reality in a way which is *different* rather than 'better'. The point, then, is not methodological or conceptual hegemony. Instead, it is to open up the possibility of knowing different kinds of realities. It is to open up ontology. Mol and Mesman (1996) make a similar argument. Comparing both Symbolic Interactionist and semiotic studies of neonatal care, they sum up by writing that:

> "Symbolic interactionism opens up a space in which the worlds of [various] groups are made audible – the voices of those who are usually able to make themselves heard, as well as those who are usually silenced and forgotten… Symbolic interactionists try to be on the side of the weak…
>
> "Semiotics [on the other hand] is not about people, whether winners or losers. It is about signs, or other entities, co-constituting each other and together forming a discourse, a network, a logic or another 'Order of Things'… Semiotics shows [the effort it takes to produce these networks]. It makes the fragility of the established order visible, and shows that it is constantly in the process of being established" (Mol and Mesman, 1996: 432-433)

Mol and Mesman's comparison, then, is not interested in arguing 'for' either of the two approaches but are instead interested only in explicating their differences. Each, they argue, possesses a different 'political style' (pp. 435) and produces knowledge of different kinds of realities. There is no point, then, attempting to reconcile the two or attempting to assert the validity of one over the other. Neither knows 'better' than the other; they are both more or less good at what they do. And that is enough.

This argument is pursued further by Law and Benschop (1997) who outline their argument through an examination of the ontologies performed by different styles of painting. One painting they examine – Uccello's *The Battle of San Romano* – is said to enact an external, Euclidean world which is knowable from any number of different perspectives (pp. 160-161). In this example, then, there is a singular reality which can be perceived in a multitude of different ways. Another painting – Vermeer's *View of Delft* – is said to enact a reality which lacks a specific fixed position or perspective and therefore a reality which is seen in various ways at once. Another still – Blanchard's *Le chat dor, les souris dansent* – is described as enacting an ambivalent, flexible reality which might be rendered coherent through any number of different narratives. And so on.

The point of their analysis is to demonstrate how modes of representation perform particular ontologies. "Description," they contend, "is never innocent" (Law and Benschop, 1997: 175).

But in making this contention, they also argue that modes of representation engage in a particular kind of *politics:*

> "To represent is to narrate, or to refuse to narrate. It is to perform, or to refuse to perform, a world of special assumptions populated by subjects and objects. To represent therefore renders other possibilities impossible, unimaginable. It is, in other words, to perform a politics. A politics of ontology" (Law and Benschop, 1997: 158)

Representations perform politics, then, because they implicitly set limits on the conditions of possibility. While realities are mutable, modes of representation pin them down, define them, and exclude the possibility of alternate forms or orderings. There is a question, then, of *choice*: what realities to perform?

This notion of what has become known as "ontological politics" (e.g. Mol, 1999) led in different directions. On the one hand, it led towards studies of ontological politics in practice (e.g. ibid.). On the other hand, however, it also led towards methodological and conceptual reflexivity. In contrasting different versions of social constructivism, Law and Singleton (2000: 767) write:

> "Both SSK and SCOT proceed by assuming they are able to offer pragmatically adequate descriptions of technological and scientific practice. They choose, often knowingly, to ignore the performative consequences of their own descriptions. By contrast, actor-network theory and, to a greater extent, feminist technoscience studies choose to wrestle with the fact that they (and therefore their own accounts) are socially located, noninnocent, and therefore political performances. This suggests that they don't offer simple descriptions, but make a difference."

Through this reflexive version of ontological politics, method and methodology cease to be only technical matters and become political and ethical matters as well. Methodological choices are therefore not about selecting the 'most appropriate' set of tools and practices, but about choosing the kinds of realities that will be performed through research. Implicit of arguments within feminism (e.g. Haraway, 1988) and elsewhere (e.g Becker, 1967), the notion of ontological politics is therefore suggestive of the question: whose side are we on?

To sum up, then, the emergence of post-ANT was both a continuation and a reformulation of early ANT scholarship. On the one hand, post-ANT literature was grounded entirely within the ontological premises of early ANT work. Anti-foundationalism, semiotics and constructivism remained central. On the other hand, the move towards post-ANT entailed a significant shift of focus from the ways in which realities are structured and ordered to the

ways in which multiple different realities are produced and interact with one another. In the turn towards ontological multiplicity – explored through concepts such as fractionality and fluidity – the emerging post-ANT studies worked towards addressing the erasure of the non-standard which was the focus of Star's (1991) critique of ANT. Similarly, through their emphasis upon ontological heterogeneity, the emerging post-ANT studies addressed Lee and Brown's (1994) concerns about ANT as a 'master narrative'. And through the reflexivity inspired by the notion of ontological politics, Haraway's (1997) criticisms of ANT studies' own politics came to be addressed as well.

More could be written about the emergence of post-ANT. De Laet and Mol (2000) explore in detail the notion of 'fluid' topologies through a case study of the Zimbabwean bush pump. Law and Mol (2001) explore a further kind of topology – 'fire' – in which realities are maintained through the simultaneous enactment of presence and absence. Law (2004) turns the notion of ontological politics into a concern with the many 'goods' which might be enacted through social research. And so on. However, it is with these key themes and concepts – fractionality, heterogeneity, ontological politics – that the pinboard method is principally concerned. As such, the Chapter now moves to the final section where the pinboard method will be considered in detail.

The Pinboard Method

Outlined at the end of Law's (2002) *Aircraft Stories*, the pinboard is articulated as a method by which the empirical and political concerns of post-ANT might be engaged with. Hence, in general terms, the pinboard is a method for grappling with and articulating fractional, non-coherent realities. To do this, the pinboard works through juxtaposition and contrast to highlight differences and points of tension between different versions of reality. Thus, in practical terms, it requires the researcher to present and work through a wide range of elements – texts, talk, images, stories and whatever else – that are placed into opposition with one another.

In the context of post-ANT scholarship, the pinboard has remained fairly insignificant. While there are many studies that take up the issues of post-ANT (e.g. Bertoni, 2012; Carolan, 2004; Lin and Law, 2013; Moreira, 2000), practically none of these make use of a pinboard approach. Indeed, examining the 415 citations of *Aircraft Stories* listed by Google Scholar, only *one* (Law, 2006) explicitly refers to and deploys a pinboard account. This absence of interest in the pinboard perhaps stems from the fact that Law is not especially clear about what the pinboard method is. In *Aircraft Stories*, Law (2002) focuses on illustration rather

than discussion and the pinboard is outlined explicitly only in the final chapter. There, Law articulates the pinboard's conceptual foundations (i.e. the issues raised by post-ANT scholarship outlined above) and how the pinboard has been enacted in each of his previous chapters. But for all this, there is a distinct lack of explicit detail concerning its actual implementation in practice.

In order to produce a clear outline of the pinboard method, then, it is necessary to infer primarily from Law's illustrations rather than his discussions. But to begin with, an overview (this same quote was presented in the Introduction):

> "[The logic of the pinboard] is one of juxtaposition, of pastiche, and yes, it claims that somehow or other these bits of paper, these postings, are more or less equivalent. That they exist together on the same surface and may expose themselves without the necessity of a single order, may jostle one another. Yes, they may make links with each other or overlap. They may resemble one another or differ. Help one another or not. But this is a logic that also supposes that they do not, except coincidentally, belong to one another as part of a single, larger whole. They do not, except coincidentally, belong to the same narrative" (Law, 2002: 189)

Law enacts this general idea in practice through a presentation and discussion of a multitude of discrete points of interest throughout the book. There are two types of these. The first, which is exemplified in the Introduction to this thesis, is the 'exhibit': a quotation, snippet of text, photograph, diagram, or some other resource which is relevant to the topic at hand. The second, in contrast, is a short story or narrative composed specifically for the purposes of the text.

In general terms, Law uses these two types of resource in a more or less similar manner by making them the focus of his discussion and argument. However, there are some slight differences in the way this is done for each. Where exhibits are deployed, these are accompanied by a commentary which explains the relevance of the exhibit, takes the reader through its relevant features, and juxtaposes it with others to throw their similarities and differences into relief. An illustration:

> "[T]he table implies and performs a form of coordination. When nouns and the different specific object positions appear in a list or a table, they are being made to go together. But this is simply a first step. For in the present instance at least, these relations of visual simultaneity also perform *relations of hierarchy*. Components of the table, its elements, are being coordinated in ways that assure their asymmetry" (Law, 2002: 20)

In this example, Law is writing about the ways in which various techniques help perform the focus of his study – the TSR-2 aircraft – as a singular coherent object. Specifically, here, he is outlining the way in which a table of contents renders different versions of the TSR-2 aircraft together in a particular form as a consequence of the table's structure. Law's discussion, then, consists of a brief analysis of the exhibit presented, signifying to the reader why it is relevant and tying it to the overall argument of the chapter produced through these vignettes.

Law's deployment of narratives is similar to his deployment of exhibits. They are short, typically not more than a few hundred words long, and each narrative constitutes its own account which works independently of the others. While the narratives he presents are always tied to a common argument and progress from one to the other with some sense of progression, they do not flow as a single story and frequently overlap or move in different directions.

As with the exhibit, the narratives that Law presents are accompanied by discussion. This discussion, however, does not follow the narratives as closely as the discussion of exhibits in other chapters. Thus, rather than working through and explaining each narrative in detail, Law instead uses his discussion to tie one narrative to the next and to link them to the overall argument of the chapter. Law therefore oscillates between story-telling and argument in these chapters and the end result is that while the narratives presented do not constitute a coherent account of the object they perform, they do nevertheless perform a coherent theme or argument.

In accordance with this outline, it is possible to identify examples of research which make use of a pinboard-like approach even if they do not explicitly define themselves as such. For example, Jensen (2008) works through a series of non-coherent stories of gift-giving which are used as the focal-point of his discussion. Moreira (2004) works instead through a series of exhibits to articulate surgery in a variety of topographical spaces. Mol's (2002) study of arthrosclerosis outlined in the introduction may also stand as a further example, as she works through a series of vignettes as she describes various versions of arthrosclerosis. Some of Law's own studies (written with others, e.g. Law and Lien, 2012; Law and Mol, 2011; Law and Moser, 2012) are also written in a manner which implies a pinboard approach.

To this point, however, the pinboard method has been discussed primarily as a mode of writing rather than a mode of analysis. Indeed, it is not clear from *Aircraft Stories* itself whether the pinboard method is more than simply a way of presenting and organising accounts. With regards to this, however, Law's (2006) article "*Pinboards and Books:*

Juxtaposing, Learning and Materiality" is instructive as it deploys the pinboard quite explicitly as a distinct kind of analytical practice. Law's deploys a pinboard in this article quite literally. Outlining his process, he describes (with accompanying images) how he produced a physical pinboard filled with an array of texts and images related to the topic of his study. This, he explains, was employed as a means of analysis by using the surface to experiment with various associations between pieces of data:

> "I experimented for some considerable time to see what tensions and patterns might be made visible or enacted. The process was flexible, and there was no right answer. The bits and pieces might have been arranged quite differently" (Law, 2006: 140)

Accordingly, the pinboard can be understood not only as a sensibility to fractional non-coherence but also as a discrete mode of analysis. In this way it can be rendered distinct from the examples of pinboard-like accounts which were highlighted above. The flat surface of the pinboard and the freedom it provides to rearrange and reformulate data allows the researcher to experiment with a multitude of associations rather than tying data to ever more rigid codes or categories as is typical in qualitative data analysis (Bryman, 2012; Schutt, 2012). Through such experimentation, the researcher can draw out patterns, contrasts and tensions between the data which are of interest to the topic at hand.

To move towards a conclusion, then, here is an outline of how the pinboard method might be enacted in practice:

Firstly, the pinboard works through a presentation and discussion of an array of points of interest. These are the focus of the account. Points of interest may be presented as exhibits derived directly from source material, or may be short stories or narratives that have been synthesised from that material instead.

Secondly, a pinboard account proceeds by explicating these points of interest and relating them to one another on a 'flat' surface. That is to say that while they are compared, contrasted, associated and rendered distinct, they are not subsumed into a hierarchical relationship whereby some are rendered more important or 'real' than others.

Third, the account itself is derived from an analytical approach which mirrors the final presentation of the data. That is to say that a literal pinboard is used as a means of exploring the data and juxtaposing different elements to produce patterns and points of interest. There is no assumption that any possible ordering of the pinboard is more valid or authentic than another; its arrangement is both pragmatic and contingent.

These three points are taken as a basic framework for the pinboard. In later chapters, some further points shall be explored and evaluated. For example, in Chapters 3 and 4 pinboards are used to present a largely descriptive account of early telemedicine and its histories. However, Chapters 5 and 6 experiment with the pinboard as an explanatory approach as well. Hence, this framework is used in the thesis as a starting point for its examination of the pinboard method rather than as a definite, rigid set of procedures.

Chapter 2

Researching Methods

This Chapter is about method. But while ordinarily the methods of social science are its resources, in this study method is also a topic of enquiry. So if this Chapter is about method, then it is more specifically about *methods of researching method*. With this in mind, the Chapter is divided into two parts. In the first, a strategy for analysing the pinboard method is produced. To do this, two case studies of methodological innovation – Grounded Theory and Qualitative Comparative Analysis – are presented with a view to drawing out key principles for researching methods. Following this, these principles are worked together with the empirical case of early US telemedicine to produce an analytic strategy for the thesis.

In contrast, the second part of this Chapter is concerned with the methods and practices involved in the production of this thesis. On both ethical and epistemological grounds, it explicates the meandering process by which this thesis moved from its original to its current aims and objectives, as well as the processes by which its data were produced and analysed.

Researching Methods: An Analytic Strategy

For all the wealth of books, articles and methodology sections explicating the many practices of social research, practically none relate to the study of method itself. Method is the technique rather than the object of study. The consequence of this is that there are no established rules, methods or strategies for analysing method. Studies researching methods are therefore undertaken in a more or less ad hoc manner.

In order to produce an analytic strategy for this thesis, then, it is necessary to look towards examples of methodological innovation rather than methods handbooks. To that end, two case studies of methodological innovation will be presented below. The first is Glaser and Strauss's (1967) Grounded Theory and the second is Ragin's (1988) Qualitative Comparative Analysis (QCA). These two cases have been chosen because, in context, they are comparable to the pinboard method in terms of their novelty. Grounded Theory, by inverting what was then the taken-for-granted association between empirical research and social theory,

constituted a significant departure from existing sociological practice. Similarly, by shifting the focus of analysis in comparative research from variable to case, Ragin's QCA inverts the standard practice of conventional multivariate statistical analysis. Both, then, constitute shifts in methodological practice in a similar vein to Law's pinboard method.

Grounded Theory

Defining a generation of qualitative sociological research, Glaser and Strauss's (1967) *The Discovery of Grounded Theory* stands as one of sociology's most prominent examples of methodological innovation. Worked out in the process of their research on death and dying (Glaser and Strauss, 1965a; 1968), the principles of Grounded Theory inverted what was then the taken-for-granted relationship between theory and empirical research. Rather than using theory to test pre-conceived theoretical premises, Glaser and Strauss's approach revolved instead around deriving theory inductively from empirical data.

The Discovery of Grounded Theory itself is written in the style of a methodological manual or manifesto rather than a polemic. After outlining the basic premise and purpose of Grounded Theory, the text moves to present in detail a set of principles and techniques for producing it. Following this, several examples of qualitative comparative research are presented to compare the analytical strategies employed in those studies with that of Grounded Theory. And finally, in the last chapters of the book, the implications of Grounded Theory for social research are discussed.

Overall, the text is focused on explaining the practice of Grounded Theory rather than demonstrating it. While examples of actual research are sometimes used to illustrate the points being made – most notably in the chapter comparing Grounded Theory with analytic strategies used in other research publications – this is nevertheless quite infrequent. Moreover, the research project through which Glaser and Strauss produced Grounded Theory is explicitly used only in their penultimate chapter. Hence, in spite of the fact that this research was instrumental to the production of Grounded Theory (Kearny, 2007), it is more or less invisible in the text.

In *The Discovery of Grounded Theory*, then, there is something of a disjunction between the methodological principles being outlined and actual research practice. In some of their early publications, however, Glaser and Strauss enact a more clear relationship between their methodological and empirical work. For example, in his overview of the comparative method (a precursor to *The Discovery of Grounded Theory*) Glaser (1965) illustrates his paper

frequently with examples drawn from their concurrently published book *Awareness of Death* (Glaser and Strauss, 1965a).

More important, however, is the appendix to *Awareness of Dying* in which Glaser and Strauss (1965a) describe their research practices and, implicitly, work through the principles of comparative social research that they outline in an ancillary text (Glaser and Strauss, 1965b). Here is an excerpt:

> "When the field researcher decides to write for publication, then he faces the problem of conveying the credibility of his discovered theory so that readers can make sensible judgements about it. [In part, this requires the researcher to] get readers to understand his theoretical framework. This is generally done by giving an abstract presentation of the framework and its associated theoretical statements, usually at the beginning and end of the publication but also in segments throughout the publication. We have written theory on almost every page of the book" (Glaser and Strauss, 1965a: 290)

This paragraph does several things at once. Firstly, it constitutes a description of Glaser and Strauss's approach to credibility. The final sentence, "[w]e have written theory on almost every page of the book", implies the argument that their text is credible by virtue of its clear and frequent explication of theory. Secondly, however, it also produces the notion of credibility as a methodological concept. While their assertion – that the researcher "faces the problem of conveying credibility" – is presented as fact, in the context of contemporary research practices this was a novel concept. Hence, on the one hand Glaser and Strauss indicate how their text produces credibility, while on the other hand they perform credibility itself as a meaningful methodological concept.

There is more, however. Following on from the second point, the third is that this excerpt works to transform Glaser and Strauss's study into an exemplar of the methodological principles being constructed. Consider again their final sentence: "[w]e have written theory on almost every page of the book". This is triumphant, carrying with it not only the implication that text is credible but also that the reader should return to the text as an example of performing credibility in sociological writing. Following on from that, the fourth and final point is that by rendering their text an exemplar of the methodological principles they outline, Glaser and Strauss implicitly produce an inverted duplicate of their text in which it is method, not their substantive topic, which is spotlighted. This duplicate text is a study of method-in-action and permits the reader to evaluate the effectiveness and value of the methodological principles espoused.

As a case of methodological innovation, then, Grounded Theory is multifaceted. On the one hand, Glaser and Strauss work through statements of principle to produce a methodological manifesto. In this sense, Grounded Theory is constructed out of abstract methodological discussion rather than through research practice. But on the other hand, the methodological account which is coupled with *Awareness of Dying* performs methodological research through an empirical case study. In this alternative sense, Grounded Theory is itself grounded in empirical research practice.

Qualitative Comparative Analysis

In comparison to Grounded Theory, the impact of Ragin's (1987; 2000) QCA method on social research has been modest. Nevertheless, it constitutes an innovation similar in kind to that of Grounded Theory. Just as Grounded Theory inverted the relationship between empirical data and social theory, QCA inverts the relationship between cases and variables such that it is the case, rather than the variable, which is rendered the central focus of analysis.

The Comparative Method is Ragin's (1988) seminal work on QCA. Broadly speaking, the book can be divided into two parts. The first is concerned with explicating the theoretical and conceptual issues related to QCA as well as problems with existing methods of analysis. The second section in turn shifts attention to QCA itself, beginning with a description of its basic logic, followed by a description of the practice of QCA and finishing with a series of examples.

Similar to *The Discovery of Grounded Theory*, then, Ragin's text works primarily through abstract methodological discussion and a detailed description of methodological principles. Similar too is the fact that Ragin's own research is invisible in the text, in spite of the importance of his research activity for the production of QCA:

> "My interest in developing and formalizing techniques of qualitative, holistic comparison originated in the frustrations I experienced as a comparative sociologist. I was trained… to use multivariate statistical techniques wherever possible. I often found, however, that these techniques were not well suited to answering some of the questions that interested me" (Ragin, 1988: vii)

Going on, Ragin writes that his initial response to this frustration was to attempt to reformulate his interests and questions so as to make them amenable to multivariate analysis. This, however, did not prove satisfactory and he therefore turned towards a reformulation of method instead. Ragin's everyday research practices, then, were instrumental in the formulation of QCA, but aside from this brief outline in the preface there is no trace of them in the text.

In contrast to *The Discovery of Grounded Theory*, however, Ragin's text makes strong use of comparison throughout. In the first section, by articulating various different forms of comparative analysis, Ragin implicitly compares QCA with its alternatives and therefore emphasises the distinctiveness of his new method. Similarly, in the second section, the chapter presenting examples of QCA-in-action does so by using data drawn from studies deploying conventional statistical methods. Accordingly, this chapter does not merely present examples of QCA in practice but draws a direct comparison between the results of QCA and the results of conventional multivariate analyses.

In addition to this, Ragin also offers a small amount of critical reflection on both the examples he presents and his method more generally. For example, he highlights that the cases he works through compare QCA only with conventional multivariate analyses and not with recent statistical innovations designed to analyse categorical data such as log-linear modelling and logistic regression (pp. 161). In turn, Ragin uses this reflection as an opportunity to develop – briefly – a comparison between QCA and categorical data analysis. Even in reflection, then, Ragin's strategy is underpinned by comparison.

Researching Methods: Three Principles

On the basis of these two exemplars, it is possible to highlight three 'principles' for researching methods. The first of these is e*xemplification.* While both cases focus on explicating methodological principles, they also work through examples in order to illustrate and exemplify those principles. In the case of Grounded Theory, this is done through *Awareness of Dying* (Glaser and Strauss, 1965a) while in the case of QCA this is done through a series of small secondary analyses. These exemplifications illustrate both the principles and practicalities of the methods they pertain to and also demonstrate the functionality of the methods in practice.

The second principle is *comparison*. Again, this is evident in both the cases examined. In the case of Grounded Theory, comparison was used to illustrate the differences between Grounded Theory and other strategies of qualitative data analysis. Ragin uses comparison more extensively, juxtaposing QCA against alternatives both in principle and in practice. The comparative work done in each instance is important not only because it helps define the central features of each method, but also because it presents an opportunity to test them against alternatives.

The third and final principle is *critical reflexion*. In the two cases examined only Ragin's demonstrates explicit critical reflexion and even then only to a limited extent. Nevertheless,

his reflexions constitute a powerful working-through of his method which helps to delineate its boundaries and contours. It is this final principle, then, which transforms a text from an explication to a study of method. Glaser and Strauss in their methodological writing describe a set of practices, while Ragin works not only to describe but interrogate a set of practices.

Combining these three principles, an analytic strategy for researching methods might therefore consist of the following: 1) an empirical case study designed to exemplify the method in question; 2) a comparison between that method and its alternatives grounded in the empirical case; and 3) a critical reflexion on the method's implementation and outcomes. The final part of this section outlines how this strategy has been translated into practice for the purposes of this thesis.

Telemedicine as Method

As was indicated in the Introduction, telemedicine is an apt case for this study for two key reasons, both of which relate to the analytic strategy outlined above. Firstly, the case of telemedicine is an effective means of exemplifying the pinboard as it resembles closely Law's own case used in *Aircraft Stories*. Since both are historical cases necessitating documentary and archival research, the kinds of resources used in this study are the same as those used by Law and therefore there is no need to translate the pinboard method for use with different kinds of data. Furthermore, both cases are strongly related to science and technology and they share a number of features with regards to their development: controversy, political significance and eventual failure. These similarities allow for the selection of specific case studies which mirror those in *Aircraft Stories* and allow specific ideas to be tested.

Secondly, telemedicine is an apt case study because there are already a number of histories which have been written about telemedicine. This literature draws heavily on conventional narrativistic methods to describe early telemedicine and its development which makes it an ideal point of comparison for the pinboard method. What is more, the data used to construct the most prominent of these histories (Bashshur and Shannon, 2009) is held in an archive at the US National Library of Medicine. This allows for a comparison using more or less the same set of resources, which will strengthen the validity of the analysis.

Here, then, is an outline of how the analysis will proceed:

In Chapter 3, the extensive literature on the history of telemedicine is outlined and discussed. This is done with a view to setting up comparisons which will run throughout the subsequent pinboard case studies. This Chapter itself is written as a pinboard and for two reasons. Firstly,

and most simply, it is to familiarise the reader with the method prior to its deployment in later Chapters. Secondly, and more importantly, it is done so as to produce a wider scope for comparison. Existing histories of telemedicine vary considerably and although they commonly deploy a narrativistic mode of analysis they nevertheless do so in different ways. Thus, through producing a pinboard account of this literature, the heterogeneity of narrative itself is articulated and maintained.

Chapter 4 is the first and most simple of three case studies. In this Chapter, a broad overview of early US telemedicine is presented through a descriptive pinboard account. The primary purpose of this Chapter, then, is to exemplify the use of the pinboard to produce wide-reaching descriptions of a case, as well as to familiarise the reader with the topic of early telemedicine. In the conclusion to this Chapter, the account that has been presented is compared with the narrativistic accounts of telemedicine outlined in Chapter 3, so as to demonstrate some key points of contrast.

In contrast to Chapter 4, Chapter 5 is a more focused case study which examines telemedicine research and practice in Nebraska in the 1950s. Counterpoised against Bashshur and Shannon's (2009) explanation for the emergence of US telemedicine, a pinboard is used here to develop an alternative account through describing early Nebraskan telemedicine and its interactions with the politics of mental healthcare. To do this, the various links between Nebraskan telemedicine and the politics of mental healthcare are explicated so as to produce an heterogeneous account of their interpenetration.

The final case study in Chapter 6 is also a focused study but turns attention to the decline of telemedicine in the mid-1970s. This case is selected with a view to working through the implications of the following quotation from Law (2002: 201-202):

> "as I worked my way through the project and collected material I was charged, in one way or another, with the responsibility of narrating the project and its downfall. 'Why', I was being asked, 'did it go wrong? And what can we learn?' This was uncomfortable… because it implied the need for a single narrative, a dominant narration."

Law's problem with the narrative he was being asked to produce is that it was necessarily teleological: it had to work towards the conclusion that the innovation failed. Such an account, then, would result in the *reduction* of the TSR-2 project to its failure. In response, Law inverts the question, asking not 'why was the project a failure' but instead: "how it was that the project managed to hang together for as long as it did" (pp. 202). From this reversed

position, the object is no longer taken-for-granted and is instead performed as an accomplishment produced and held together through a multitude of heterogeneous actors.

The decline of telemedicine in the 1970s parallels this issue that Law raises. Hence, in fact, this final case study does not focus on telemedicine's decline but instead focuses on how telemedicine was able to hold together for as long as it did. In doing so, it also works primarily through narratives rather than exhibits to exemplify that alternative form of pinboard practice. And, finally, the account that it produces is contrasted with the accounts of telemedicine's decline presented in existing histories of telemedicine as outlined in Chapter 3.

With the analytic strategy of this thesis now outlined, the Chapter turns to consider the practices which were involved in its production.

An Interlude: The Strength of Modest Methods

> "Despite being couched in the past tense, method resembles, more than anything else, the recitation of a formula. We find, not laboratory tasks, but a laconic checklist of steps taken. Rather than reasoned selections in which the doings of the laboratory are inserted and stabilised, we find a catalogue of sequential manipulations stripped of both context and rationale. In place of an account of social negotiations of particular agents through which the laboratory choices were derived, we find a selective recording of the transient results of those negotiations permeated by technical particularisation. In sum, method is presented as a flow-chart of selections disguised as *non-selections*, for lack of relevant contextualisation" (Knorr-Cetina, 1981: 115)

Knorr-Cetina outlines here the incongruence between research-in-practice and accounts of research practices. Through her observations of science-in-action, she concludes that science is a complex and messy endeavour with research projects constituted by a multitude of difficult negotiations, reasonings and choices. Yet, in contrast to the practices of science, *accounts* of scientific practice erase this complexity and messiness in favour of clean, orderly and clinical descriptions of method. The technologies and techniques of method are described, but the research process itself is rendered invisible. Accounts of method, in other words, are accounts of method 'in principle' rather than method 'in practice'.

Although Knorr-Centina's observations are drawn from laboratory science, they are equally applicable to social scientific research too. While it is not especially controversial to suggest that social science is both complex and messy, and that accounts of social scientific research fail to capture that mess, Hart (2014) presents some data to support this contention.

Examining several recent volumes of the journal *Sociology*, he indicates that while there is plentiful discussion of epistemology, sampling, and research technique there is practically no discussion of the actual processes of doing research.

The consequence of this, so Hart argues, is that the difficulties, problems, mishaps and failures of the research process are all implicitly obfuscated, resulting in knowledges that appear stronger and more robust than they really are. In response, Hart calls for social scientists to adopt a 'disposition of honesty' and therefore to explicate "all the details that are relevant to the current context [of research]". In this way, by 'coming clean' and acknowledging the limitations of their research, social scientists can avoid exaggerating the strength of the knowledge they produce.

For Hart, this is a matter of ethics, for his argument rests on the assertion that it is wrong of social scientists to falsely inflate the value of their research. But there is another – perhaps more powerful – argument to be made which pertains not to ethics but epistemology. Here is Law (again):

> "[Story-telling] always leaves a series of analytical loose ends and problems. But in a modest pragmatism it is right to acknowledge that this is the case. I believe this because I'd encourage a practice where we can affirm our weaknesses as well as our strengths. And I'd like us to do this, not because I wish to celebrate deconstruction. This is uninteresting since we all know that such deconstruction is possible. Rather it is because this is a good way of creating *intellectual tools that are locally robust on explicit rather than implicit discursive grounds*. And, of course, exploring these places where they do not work (rather than covering these up) is one good way of doing this" (Law, 1994: 85; original emphasis)

Law, here, is arguing that explications of method-in-practice are not inherently a source of weakness but might also be a source of strength. Method, he argues, invariably produces knowledges which are more or less local, idiosyncratic and incomplete. They do not work everywhere, nor do they work all of the time. And even where they do work, there is still much that remains unknown; other knowledges can always be produced. Yet in spite of all of this – and here is the key point – knowledges do nevertheless work, *so long as they remain tied to the circumstances of their production*.

The point, then, is that the explication of research practice contextualises knowledge and therefore delineates not only the limitations and shortcomings of that knowledge but also the conditions in which that knowledge might be considered valid, robust and useful. Furthermore, the reflexivity inherent in the explication of 'weaknesses' itself produces a

more robust science more keenly aware of its boundaries and limitations. Ethical considerations aside, therefore, the explication of research practice is an important epistemological tool.

It is this disposition which is adopted in the following account of method-in-practice. Performing both an ethical and epistemological reflexivity, it works to draw out both the weaknesses and problems of the thesis but also its sources of strength. It is divided into two parts. The first is comprised of two narratives which outline the many changes that this thesis went through between its conception and eventual completion. These narratives provide context for the thesis and work as a counter-point to the linear conception of social research which pervades accounts of method and regulations concerning doctoral research. Following this, the second part describes how data for this thesis were produced and (initially) analysed. These narratives constitute an account of practice which demonstrate how the thesis was produced.

Research in Transition

The original purpose of this thesis was to construct a theory of institutional innovation and change through a case study of 'home-based medical care'. It had two main theoretical starting-points: 1) Neoinstitutional theory (e.g. Lounsbury 2001; 2008; Lounsbury and Crumley 2007); and 2) Neo-Durkheimian social theory (e.g. Alexander, 1988). The proposal began with the assertion that, while Neoinstutional theory could explain the adoption of new institutional practices, it lacked the ability to explain the *origins* of those practices. The proposal continued by drawing parallels between Neoinstitutional theory and a re-reading of Durkheim's classical works, with the suggestion that various elements of Durkheim's sociology could be transformed into an effective theory of the origins of innovation. The case study, then, was to be used as a means of developing, articulating and testing this theory.

It is obvious that this thesis has transformed into something quite different. There are no traces of concern with Neoinstitutionalism or Neo-Durkheimianism. Nor is there concern for the production of theoretical accounts or explanations (quite the opposite, in fact!). Even the empirical focus has shifted, albeit subtlety, from 'home-based medical care' to telemedicine. And yet these transformations were neither planned nor even intended. They emerged, instead, as an unintentional consequence of my reading and research. As I worked, I developed new interests and revised – quite significantly – my understandings of what it means to do social science. And, often, it was only in retrospect that I appreciated how far I had drifted from my original aims.

Here, then, are two narratives. The first outlines how it was that the thesis shifted from a focus on home-based medical care to a focus on telemedicine. The second outlines how the thesis shifted from a concern with Neoinstitutional theory and Neo-Durkheimianism to STS, ANT and finally to the pinboard method. The purpose of these narratives is to contextualise not only the remainder of the Chapter but also the thesis. Much of the research I have done to produce this thesis was undertaken with quite different objectives in mind and – in retrospect – would have been done quite differently had I known in advance the arguments I would later seek to develop. But these narratives are also relevant because they articulate a part of the research process itself. Without the meandering and drift outlined in the narratives below, this thesis would not be what it is. These outlines, then, also constitute a counter-narrative against the clean, linear accounts of method which are typically packaged in research publications and which are implicitly embedded in the guidelines and regulations concerning doctoral research.

From Home-Based Medical Care to Telemedicine

When I first began to think about studying for a doctoral degree, I knew it would be grounded in Neo-Durkheimian social theory. I had derived an interest in Durkheim from my undergraduate studies and was already perusing this interest through my undergraduate dissertation. My concern with innovation and change was derived from my interest in Durkheim, specifically from critiques of his work which often assert that his sociology is incapable of explaining or theorising social change (e.g. Lukes and Scull 1983). My own reading of Durkheim (especially Durkheim, 1900; 1915; 1952) did not cohere with this assertion, however. Hence, I was interested in developing a counter-argument explicating a Durkheimian theory of social change.

But while my theoretical interests were well-developed, my empirical interests were not. The selection of home-based medical care (HBMC) as the empirical focus of my research was, therefore, more or less arbitrary. The topic was suggested by Tiago Moreira – at the time my undergraduate dissertation supervisor – who was himself familiar with HBMC primarily as a result of an abandoned research project he had designed some years before. As home-based medical care was a fairly recent phenomenon, it seemed as good a topic as any to study and in the absence of any other interests I accepted it as my empirical focus.

The movement from HBMC to telemedicine occurred during the first few months of my doctoral research and arose due to the proximity of those two concepts. The notion of 'home-based medical care' refers to the provision of health services in users' homes rather

Reflexions: *On Caring for the Object*

The scholars and practitioners who write about early telemedicine care for it. Of all the histories of early telemedicine examined in Chapter 3, not one appears to be written by someone uncommitted to its practice. Accounts of telemedicine are overwhelmingly positive, with practical, ethical and legal issues discussed as barriers to be overcome rather than as fundamental problems. Similarly, through narratives of technological progress the technical and practical issues of earlier telemedicine systems are consigned to history since now (be that 1995 or 2010!) the technology and expertise final exists to realise telemedicine's 'full potential'.

This care for the object, however, is not limited to those writing about telemedicine. Rogers (1995) writes that studies of innovation and diffusion are commonly characterised by what he calls 'pro-innovation bias' whereby authors are implicitly supportive of the innovation they write about. But care can manifest in other ways, as well. Law (2002) articulates a multitude of ways in which his object – the TSR-2 airplane – mattered and related to him. De Leat and Mol (2000) articulate their care for their object – the Zimbabwe Bush Pump - as "love" (pp. 225). These examples suggest, then, that care for the object can be complex and multifaceted.

So here is my point: I do not care about telemedicine.

As will be explicated more clearly below, telemedicine became the empirical focus of this study more or less arbitrarily. Prior to beginning my research, I had never heard of telemedicine and since then it has existed for me only as the object of my research. I know it neither as a set of practices nor as a technological apparatus, instead only as a series of texts. I have no direct experience of telemedicine either as a patient or observer; I know only the experiences of others performed through surveys and interviews. I have no interest or investment in its future, nor do I hold anything other than the mildest opinions on its efficacy and value.

In writing this, I do not wish to imply that my disinterest in telemedicine makes me 'objective' or in some other way better placed to write about telemedicine than those who have done so before. This is no "God trick" (Haraway, 1988). I do wish to suggest, however, that my disinterest in telemedicine has allowed for a certain

freedom of movement with regards to my study of method. Since I have no interest in telling stories about telemedicine, I am free to ignore it save for where it is relevant to my study of method. In this sense, my relationship with telemedicine is analogous to the typical relationship between researcher and method: seldom is the researcher interested in making a point about method so much as using method to make a point about their substantive topic.

My point, then, is that my disinterest in telemedicine is a methodological resource which has enabled me to focus without distraction on the issue of method. To be clear, I do not mean to claim that such disinterest is a necessary element of methodological research. Empirically, this is untrue. Glaser and Strauss (1967), for example, were able to separate their interest in the experience of dying from their methodological writing more or less entirely, while Law (2002) tells how he resisted others' interest in the failure of the TSR-2 aircraft when writing about the pinboard. Instead, I want only to suggest disinterest as a possibly valuable methodological tool and therefore that researchers interested in studying method may find some benefit in working through cases which otherwise they would find uninteresting.

than in traditional medical spaces such as hospitals and clinics. Systems make use of a variety of different technologies including emergency telecommunications systems, alarm systems, fall detectors, sensors, remote health-monitoring devices, and so on (Tunstall, 2005). HBMC is therefore constituted by a mixture of practices: telehealth (remote monitoring of vital signs and symptoms); telecare (systems designed to reduce the risk of accidents or mishaps); and also telemedicine (where health services are provided directly) (Tunstall, 2014).

When I began my research in earnest and started to familiarise myself with those three concepts, I quickly learned that telemedicine is regarded as the earliest (see for example Sävenstedt, 2004 and Hards, 2009). Given that a key focus of my research was on the origins of HBMC, I decided to focus my initial work on telemedicine with a view to exploring how it later transformed into telehealth and telecare and gave rise to HBMC. Hence, much of my early work was spent familiarising myself not so much with HBMC but more specifically with telemedicine.

Concurrent with this work, I also began to examine literature pertaining to innovation and change and this became the focus of my work a few months after I started my thesis. Having,

by that point, become more familiar with telemedicine than HBMC, I began to relate this literature on innovation and change to my current understanding of telemedicine and its history rather than HBMC more generally. The consequence of this was that as I approached the end of my first six months of work, I had more or less forgotten about HBMC as my starting point, with telemedicine having taken its place. And, by the time I realised that this had happened, I had dedicated a sufficient amount of work to telemedicine that the cost of refocusing on HBMC was too large to be worthwhile, especially given that telemedicine itself had proven interesting itself in relation to the literature I had been engaging with.

From Theory to Method

Aside from familiarising myself with HBMC and telemedicine, my early work was directed towards a review of literature concerned with innovation and change. This brought me into contact with a variety of approaches including: diffusion of innovations (e.g. Abrahamson, 1991; Gosling et al., 2003; Rogers, 1995); economics and rationality (especially Rosenberg, 1982; 1994); social history/construction of technology (e.g. Bijker, 1995; Bijker and Law, 1992; Kranzberg, 1997; White 1997); evolutionary theories of technological change (e.g. Basalla, 1988; Charlton et al., 2010; Rindos, 1985; Rosenburg, 1990); and even mimetics (Dawkins, 1989; Blackmore, 1999). This literature review confirmed the initial premise of my thesis that, while accounts of innovation and change could offer explanations for diffusion and adoption of new innovations, they lacked the capacity to explain the origins of those innovations. Armed with this conclusion, I moved towards producing my own theory of innovation.

My approach to this, however, differed from that outlined in my original research proposal as, in the time between submitting my research proposal and starting work on my thesis, I had more or less lost interest in Durkheimian sociology. In his place was Critical/Neo-Realism, which I had been heavily exposed to while studying for my Master's degree and which I had found to be a persuasive framework for research. Hence, while the overall aim of the thesis remained the same, it proceeded on the basis of Critical Realism rather than Neo-Durkheimianism as its theoretical bedrock.

My starting point for producing a Critical Realist account of change was Margaret Archer's (1995: 5) assertion that "[t]he practical analyst of society needs to know not only *what society is*, but also *how to begin to explain it*, before addressing the particular problem under investigation". In the context of my thesis, I took from this the implication that I should clearly explicate telemedicine before I began to study how it changed. Doing this was complicated by my reading of literature pertaining to both telemedicine and innovation. In

terms of telemedicine literature, it was apparent that there was no precise agreement on its definition or meaning (as outlined in the Introduction). This lack of clear definition was exacerbated by my reading of various innovation literatures concerned with seemingly quite different objects, including technologies, institutions, organisations and practices. Hence, while I had begun with the intention of studying institutional change (and had therefore conceived of telemedicine/HBMC as an institution), I had at various times also been conceiving of telemedicine as a technological apparatus, as an organisational system, as a set of practices and so on. When I realised this oscillation I was performing between different conceptualisations of telemedicine, I became convinced that attempting to study its emergence in terms of only one such conceptualisation was problematic since in fact telemedicine crosses all of them.

To reconcile this, I turned to the ontology of Neo-Realism as explicated by Bhaskar (1975). Focusing especially on the notion of emergence, I began to construct telemedicine as an emergent phenomenon comprised of, but not reducible to, a multitude of persons, practices, machines and relations. This conceptualisation of telemedicine then served as a springboard for a general conceptualisation of change. In so far as telemedicine was conceptualised as an emergent composite of individual elements, then change was conceptualised as either: an addition to or subtraction from those elements; a transformation in one of those elements; or a change in the relationship between those elements.

At this point, I had realised Archer's imperative outlined above by producing an explication of both telemedicine *and* change. At the same time, however, I began to develop doubts about the approach I was taking with the thesis, in particular with regards to the plausibility of producing a general theory of the origins of innovation. Given the uniqueness of both individual innovations and the circumstances within which they were produced, I struggled to envisage what might be the general characteristics that explained these events. While this left me with the possibility of producing an explanation specifically of the origins of telemedicine, I was unconvinced that this would be sufficiently different from or superior to Bashshur and Shannon's (2009) existing history of telemedicine to constitute a 'novel' contribution to knowledge.

The original aim of my thesis, however, was delivered its final death-knell by Actor-Network Theory. While I was aware of ANT during the first six months or so of my research, I had not initially made much of an effort to engage with it. In preparation for writing a review of innovation literature, however, it became necessary for me to examine ANT in some detail. My entry-point was Latour's (2005) *Reassembling the Social* and I found myself instantly

persuaded by its arguments. Reflecting back on the work I had done thus far for my thesis, I could see that I had undertaken precisely the kinds of practices which are problematised by his critique and I therefore began to reconceptualise both my thesis and my understanding of social research more generally.

While I found Latour persuasive, however, I struggled to fully grasp the ontological implications of ANT and, as a consequence, I devoted a considerable amount of time to studying ANT texts in order to develop my comprehension. This work led me to Law's (2004) *After Method*, which I had encountered briefly during my Master's degree but not (in retrospect) understood to any reasonable degree. Reading it through thoroughly for the first time, I found myself interested especially in the notion of multiplicity which became the new theoretical centre-point of my research.

This centring of multiplicity occurred concurrently with the beginning of my empirical work. As I began to grapple with the concept I also began to collect and examine old telemedicine publications and my preliminary note-taking was heavily influenced by my interest in multiplicity. This persisted as I organised and undertook my fieldwork in the US and culminated a year later in a paper I presented at the 4S/EASST conference in Copenhagen. In that paper (Craige, 2012), I outlined three different versions of telemedicine: one related to clinical practice, a second to health care organisation and a third to mental health care (these themes will appear, among others, in Chapter 4).

In preparation for that paper, however, I once again began to have doubts about the research I was undertaking, this time for empirical reasons. The original argument of the paper was derived primarily from my analysis of published telemedicine literature that I had studied prior to my archival work in the US. As I began my analysis of the archival material, however, I found various texts which did not cohere with the argument I was attempting to develop in the paper. Specifically, while my argument attempted to divide the three versions of telemedicine it outlined between three different groups (clinicians, health care policy workers, and mental health care workers), these new texts I encountered implied that such a division was too neat. I found myself, then, uncomfortable with the reduction I was performing.

In addition to this discomfort, I continued to be concerned with the thesis's lack of definite purpose. While the transition from Neoinstitutionalism and Critical Realism to ANT had produced a revised set of concerns and interests, I had not found a specific aim or objective to replace my initial intent to produce a theory of the origins of innovation. This had persisted for around two years before, finally, the matter became settled. Having recently

finished reading *Aircraft Stories* (Law, 2002) for my literature review, Tiago and I met to finalise the central focus of the thesis. Having found *Aircraft Stories* accessible and the pinboard an interesting concept, I was inspired to suggest transforming the thesis into a study of method (and, specifically, the pinboard) rather than telemedicine and innovation. In the end, then, the thesis drifted accidentally towards a study of the pinboard method almost as arbitrarily and accidentally as it did towards a study of telemedicine. Indeed, its focus on the pinboard is very much the outcome of the work I have undertaken rather than the starting place for that work.

Methods in Practice

Having described the turbulent process by which the thesis reached its final focus, the last part of this Chapter is dedicated to an explication of method. In accordance with the notion of modest method outlined above, this section focuses upon a description of what was done rather than a description of the principles of method so as to produce some transparency with regards to the actual practices which produced the thesis. Accordingly, it is divided into three sections. The first outlines how the documentary data used in the thesis were produced; the second outlines the production of interview data; and the third offers an outline of the analytical practices deployed.

Documentary Data

This thesis deploys an array of documentary sources as its primary data. These include:

- Published texts, such as journal articles, monographs and conference proceedings
- Unpublished scientific texts, such as internal research reports and draft papers
- Government documents and reports
- Newspaper articles
- Informal texts such as personal letters, notes and scribblings on other documents

The production of documentary data for the thesis proceeded with a view to gathering as many documentary sources as was possible. In accordance with this, a multitude of approaches were used in order to minimise the risk of missing or overlooking relevant documentation. These included:

- Bibliographic tracing
- Archival research
- Ad hoc web searches

In order to identify relevant published documents, I began by tracing references provided by historical accounts of early US telemedicine. Bashshur and Shannon's (2009) *History of Telemedicine* was especially important due to its comprehensiveness, but a small number of additional documents were identified via other historical accounts. This initial pool of documents was then itself used as a means of identifying further documents in the same manner, and so on until no new references could be identified.

I determined the relevance of a document on the basis of its title and the way in which it had been used by the text in which the reference was found. Occasionally, this was insufficient to make a clear judgement and in such cases I sought additional information (e.g. an abstract). Where this too proved indecisive, I acquired the document anyway to ensure I did not overlook something which may have been important.

To acquire the documents, I began by checking availability online. Where documents were not available, either because I could not find the reference or because access was unavailable through Durham University Library, I acquired them through Durham University's Document Delivery Service (DDS). As the DDS does not allow permanent copies of whole books to be delivered, I purchased copies of books which were not available electronically to ensure I had access to the original text rather than just notes. In spite of all this, I was occasionally unable to source a document as both my own online search and a search by the DDS failed to find a copy.

While published texts made up my initial pool of documents, the majority of the documents used in the thesis were sourced from archives held at various sites in the US. Specifically, these were:

- The National Library of Medicine, Bethesda, Maryland
- McGoogan Library of Medicine, University of Nebraska Medical Centre, Omaha, Nebraska
- Arizona Health Sciences Library, University of Arizona, Tucson, Arizona

As with published documents, my starting place for identifying relevant archives began with historical accounts of US telemedicine. Identifying the sites of key early telemedicine projects, I contacted those sites by email to ask whether they held any documents pertaining to the projects of interest. This, however, proved fruitless and my messages did not receive replies. In addition to this, I also identified and contacted funding institutions to see if they held documents pertaining to telemedicine projects they had funded. Again, this did not prove

useful as I was informed that such documents are routinely destroyed after a period of time (usually 6 years).

In the end, then, I was able to find archival materials only as a result of explicit references to them elsewhere. Personal communication with Rashid Bashshur highlighted the archive held at the National Library of Medicine. The collection held at the McGoogan Library of Medicine was highlighted through references made in Bashshur and Shannon (2009). Also in Bashshur and Shannon (2009) was a reference to material held by the American Telemedicine Association, but my enquiries failed to produce anything of use for the thesis. The final collection held at the Arizona Health Sciences Library was highlighted in a paper (Freiburger et al., 2007) indicating the formation of the archive and outlining its contents.

In order to access the archived materials, I visited and worked in the US for three weeks at the National Library of Medicine and a week at each of the McGoogan Library of Medicine and the Arizona Health Sciences Library. The National Library of Medicine and McGoogan Library of Medicine were visited first and back-to-back, while I made a separate trip to visit the Arizona Health Sciences Library a few months later. Breaking the research visits in two like this proved to be very inefficient and, in retrospect, it would have been much better to have visited all three archives as part of a single trip. However, at the time I anticipated finding additional archival material elsewhere and therefore expected a second trip to be necessary anyway.

Ideally, I would have preferred to have made copies of the archived documents such that I would be able to refer back to the original texts during my analysis. However, I anticipated that this would be too costly, and therefore my initial plan was to work through and produce detailed notes on the documents during my visits. In the end, though, this itself proved to be an ineffective strategy as it took longer to work through the materials than I anticipated. After two weeks at the National Library of Medicine, I had worked through only half of the documents and had only a week left before moving on to Omaha. Accordingly, I was required to adjust my approach and I turned to copying the material instead. Helpfully, I was informed that I could make copies via photography, which was much quicker than scanning or photocopying and avoided any further expense. However, as I was unprepared for this it was necessary for me to use a low-resolution phone-camera. While on the whole this was adequate, the images were frequently blurred in the corners making small parts illegible, while in a small number of instances the text was too distorted the read at all.

Nevertheless, as a result of this shift in strategy I was able to create a copy of the remaining documents at the National Library of Medicine with time to spare. As such, I continued with this approach when working at the McGoogan Library of Medicine. When I returned to the US to work at the Arizona Health Sciences Library, I was prepared with a good-quality camera which enabled me to produce much better images. However, during my work I accidentally damaged the camera, requiring a return to the use of a camera-phone instead. By the end, I had taken around 5,500 photographs of documentary material from all three sites.

As I worked through the archival material I had copied and began to experiment with writing, I found that some of the arguments I wanted to develop required evidence from outside the material I had at hand. The most prominent example is my writing about the Nebraska Psychiatric Institute (see Chapter 6) which required data pertaining to Nebraskan politics and US mental health policy in the 1950s and '60s. Where issues like this arose, I attempted to locate resources via web searches targeted at the specific topics of interest. Usually, doing this did not produce much if anything of use. However, occasionally I found relevant resources.

Interview Data

In addition to documentary sources, the thesis draws upon a small number of interviews and some personal communication with persons related to early telemedicine work. These were:

- *Maxine Rockoff*: Programme Officer in the Health Care Technology Division (HCTD) of the Department of Health, Education and Welfare (HEW). Rockoff was a key figure involved in establishing a series of telemedicine trials funded by the HCTD/HEW in the early 1970s.
- *Reba Benschoter*: Head of the Communications Division at the Nebraska Psychiatric Institute (NPI). Heavily involved in the telemedicine research and development undertaken in Nebraska during the 1960s and '70s and (co-)authored a number of publications related to the NPI telemedicine system.
- *Jay Sanders:* Intern at the Massachusetts General Hospital in the late 1960s and later research lead on a telemedicine research project conducted in Miami in the mid-1970s.
- *Norman Weissman:* Programme Officer and later Director of the Health Care Technology Division of the Department of Health, Education and Welfare. Although not directly involved in telemedicine research as written about in this thesis,

Weissman was heavily involved in other research projects undertaken by the HCTD and as director from 1975 had a good knowledge of its activities in the 1970s.

Persons of interest were identified as a result of my documentary work. As I read through the documentary material I was working with, I noted names of seemingly important individuals to be contacted at a later date. Most of the names noted were authors of publications, but a few others came from other sources. For example, Maxine Rockoff was identified on the basis of an acknowledgement dedicated to her in Ben Park's (1974) *An Introduction to Telemedicine*, while I was put in touch with Norman Weissman by Maxine Rockoff after my interview with her.

Getting in contact with the people I had identified was difficult. Using Internet searches to find contact details, I frequently encountered instances where several people possessed the same name. Where possible, I used information about a person's state of residence and educational background to narrow down my search, but in instances where I could not be certain that I was contacting the right person I dropped them from my list. As a result, I was able in the end only to contact a small handful of people (eight initially; nine including Norman Weissman who was added later). Of those eight, only five of them responded to my initial communication and two more withdrew subsequent to their initial response (no reason for this was given in either case).

In those instances where a response was received, I sought informal consent to an interview first and then dispatched a formal consent form by post to be completed. The consent form was unremarkable, outlining (what was then) the purpose of the research, indicating that the data may be used in research publications and indicating that the interviewee may choose to withdraw at any point. Anonymity was offered as an option but not granted by default, since it would allow more flexibility with the use of interview data if the identity of the respondent did not need to be protected. None of the people interviewed chose to make their interview anonymous.

With the exception of my communication with Reba Benschoter (whom I met with in person several times while working in Omaha) all of the interviews were conducted via Skype as it would have been prohibitively expensive to conduct each of them in person. Skype was used in part because it is freely available, but also because it is a popular service with which the people I was interviewing would be more likely to be familiar with (and this in fact proved to be true). A third benefit was the availability of Skype recording software which I used to record the interviews for later transcription. Technically, however, Skype proved to be

somewhat problematic. Each of the Skype interviews were delayed as a result of problems establishing the initial connection. The interview with Jay Sanders was almost cancelled as a result of this problem but it was fortunately resolved with enough time to complete the interview. In addition to this, there were some occasional instances of poor-quality communication but these did not cause any significant problems.

The central purpose of the interviews was to follow up on things which had arisen from my documentary analysis and to cover those issues about which there were no documentary sources. In conventional methodological parlance, then, the interviews I undertook might be described as 'semi-structured' as I prepared for each of them a list of topics and themes I wanted to discuss (see Appendix B for an example). As each of the interviewees was related to early telemedicine in a different way, however, these lists were bespoke. And, anticipating new themes and topics to emerge during the interviews themselves, I ensured to leave room to follow them up.

In practice, the interviews proceeded somewhat differently to how I anticipated and each was quite idiosyncratic. My first interview – with Maxine Rockoff – was more like a conversation than an interview. At one point we worked together through some old documents she had sent me, discussing and making sense of them together. At another point, the conversation turned around onto my own research which she expressed an interest in. And so on.

My second interview – with Jay Sanders – was hurried as a result of a late start and went on with hardly a word from myself. Finally finishing a long monologue after twenty minutes or so, I used the remainder of the time I had with him to follow up on some points that he had made but he had in fact done an excellent job of covering the topics I had wanted to without me ever asking.

My contact with Reba differed as I did not formally interview her. Instead, I had a number of informal conversations with her about the Nebraska Psychiatric Institute and her telemedicine work during a number of meet-ups while I was working in Omaha. The plan, initially, had been to conduct a formal interview after I returned to the UK and had worked through the archival material I had collected from the McGoogan Library of Medicine. However, this took me much longer to do than I anticipated and in the mean time we fell out of touch.

In contrast with all these, the interview with Norman Weissman was relatively standard. However, as I had very little background knowledge about the Health Care Technology

Division (which was to be the focus of the interview) it was difficult to steer the interview towards themes and issues which were directly relevant to my research. The interview therefore meandered considerably, often in directions which would in retrospect turn out to be unproductive.

Initial Analysis and Writing

The way in which I engaged with my data transformed as my research progressed. Initially, when I first began to produce and engage with my data, my 'analysis' of that data consisted simply of reading it through and taking notes. The notes I took lacked any specific focus and were generally summaries of the text they pertained to. Where I encountered something I considered to be interesting or important, I would typical take a direct quotation for ease of reference later. My initial engagement with my data, then, was primarily aimed at familiarisation both with early telemedicine and the data I was working with.

To begin with, I took notes on paper and attached them to physical copies of the documents I was working with. However, when my fieldwork began to approach I realised that this strategy would no longer work and I began to transfer my notes into an Nvivo database. Thus, from the point of my fieldwork onwards I used Nvivo to collect and organise my research notes. I did not, however, use Nvivo for analytical purposes. Since I was inputting notes into Nvivo rather than original texts, I did not consider the analytic tools of the software to be of any use. This said, I occasionally made use of its link function to produce links between sets of note related to a similar topic or idea.

After my initial pass over the data, I began to work through it again for the purposes of writing. However, at this stage I worked from my notes rather than from the original documents due to the volume of the original documentation and the lack of availability of documents I had not copied from the National Library of Medicine. This second pass was far more focused as a result of having greater clarity regarding the questions I wanted to ask of the data (at this time these questions were informed by the post-ANT concepts ontological multiplicity but were not yet concerned with questions of method). As a result, I worked through the data using a comparative approach to construct categories comprised of like descriptions and conceptualisations of early telemedicine. At the same time as undertaking this analysis, I also began my first attempts at writing up my empirical work. The analysis and writing therefore went hand-in-hand, with my on-going writing guiding my analysis and causing me to return to the material I was working with repeatedly as I explored the arguments that I was trying to make.

Reflexions: *On Reflexion*

> "[A]pparent concessions to reflexivity, both in the natural sciences and in other disciplines that aspire to the Scientific ethos, usually involve [a form of reflexivity] which we might call *benign introspection.* This kind of reflexivity – perhaps more accurately designated 'reflection' – entails loose injunctions to 'think about what were are doing'. It is encouraged as a means of generating addenda to research reports, sometimes in the form of 'fieldwork confessions', which provide the 'inside story' on how the research was done… An exercise in introspection is usually concerned with improving the adequacy of the connection between the analysts' statements and the object of those statements. Perforce, this maintains the postulate of distinction between representation and object" (Woolgar, 1988: 22)

Woolgar, here, is writing about reflexivity. No, he is writing about 'reflection'. About 'benign introspection'. He might also be writing about what I have done in this Chapter. While they have not been referred to as such, the stories I have written above most certainly tell an 'inside story' and – I think – are something of a confession. And, for sure, the writing of these stories has been justified on epistemic grounds. Woolgar's description, then, is fairly close to the mark.

This said, I am not convinced by the negative connotations which Woolgar draws from this mode of reflexivity. Or, perhaps better, I am uncertain if they are applicable here. For if I have explicated the research process in a confessional manner, then this has been to *weaken* the claims made in this study and not strengthen them. It is to point to the limitations and weaknesses of the thesis, to say: "use with care". This, for me, is the more important of the two sides of 'modest method' outlined above: a science which is aware of its limits and which therefore possesses the possibility of overcoming them.

As for producing a distinction between the object and its representations, I hope that the narratives explicated above have done the opposite by demonstrating how both of my 'objects' – telemedicine and the pinboard – were produced through the twists and turns of my research. What 'telemedicine' is, here, is a product of disinterest and my reading of thousands of lines of text, while the pinboard is both a product of my frustrations and discomfort with other modes of analysis and, perhaps more importantly, the need for topic of enquiry.

By making these points, I am not interested in quarrelling with Woolgar. No doubt, in many cases, his assertions are valid. So my argument is more modest: simply that what Woolgar refers to as "benign introspection" need not necessarily be 'reflexivity done wrong'. Indeed, such introspection can be an effective way of delineating the boundaries of the text and of breaking down the distinction between object and representation. And if I have achieved that through the narratives presented above, then that is enough.

Chapter 3

Histories of Telemedicine

This Chapter takes as its focus historical accounts of early US telemedicine. In particular, it is concerned with explicating the ways in which early telemedicine is enacted through these accounts and the methods employed to do so. Through this analysis, it is demonstrated that these enactments are frequently used to produce narrative accounts which link early telemedicine to its more recent manifestations. As such, it is argued that these historical accounts are engaged – implicitly or otherwise – in an ontological politics concerned with constructing telemedicine not only in the past but in the present and future as well.

Accordingly, the current Chapter comprises of an analysis of existing literature related to early US telemedicine. It is divided into four parts. In the first part, a brief overview of the texts is outlined so as to contextualise the rest of the Chapter. In the second, the structure and form of accounts of early telemedicine is examined, demonstrating how they work primarily through a combination of case-based description and general summations. In the third, the ways in which telemedicine is performed through these account is explicated. Here the focus is upon accounts of telemedicine's origins, the enactment of telemedicine as technology and analyses of the early telemedicine period. Finally, in the fourth section, the Chapter outlines the various narratives that are performed in accounts of early telemedicine and the way in which narrative is used to produce particular versions of telemedicine practice. A summary is presented at the end of the Chapter.

Histories of Telemedicine: An Overview

There is no shortage of accounts of early telemedicine. Over forty are drawn from in this Chapter (see Table 3.1), although there are no doubt many more. This said, there are no published papers or books concerned *exclusively* with the history of early US telemedicine. Instead, histories of telemedicine tend to be written as either part of a wider-reaching historical account of telemedicine or as context for a paper or article concerned with some other aspect of telemedicine.

Historical overviews of telemedicine generally perform the development of telemedicine as a series of stages of 'waves'. Breen and Matusitz (2010), for example, outline a three stage historical trajectory of telemedicine from its earliest applications, through to the revival of telemedicine in the 1990s, and then into the present era of so-called "e-health" (pp. 5). Braunstein (2007) also presents a three-stage history of telemedicine, although his account focuses instead upon how the application of telemedicine systems has changed over time. Thus, while early telemedicine is described as replicating existing medical services, later telemedicine is described as moving towards remote monitoring of physiological states and more recently towards assisting patients manage their own illnesses outside of the hospital. In another paper, Wurm et al. (2008) provide an account of early telemedicine as part of their overview of teledermatology through time. Again, there are three sections: 'early telemedicine'; 'current applications'; and 'future directions'.

Other telemedicine texts tend to use a brief history as a lead-in to the main discussion. For example, Tulu and Chaterjee (2005) provide a brief account of the development of telemedicine as background for their attempt to produce a typology of telemedicine systems. Nestor (2001) provides an account of early telemedicine in order to frame telemedicine's relationship with the development of Internet technologies. Zundel (1996) provides an outline of telemedicine's early development as background to a paper concerned with the impact of telemedicine on librarianship. And so on.

In addition to these two main groups, however, there are a small number of texts which do not quite fit within either. Two of these – Whitten and Collins (1997) and Mun and Turner (1999) – both write about the development of telemedicine, but their accounts also draw upon and develop a theoretical account of innovation and change. In the case of Whitten and Collins (1997), they use the development of telemedicine as a case study for interrogating Roger's (1995) theory innovation diffusion and in particular examine the role of communications processes in the diffusion of innovations. Mun and Turner (1999), on the other hand, produce a theoretical account of the development of telemedicine based upon a description of past and present telemedicine systems.

Another set – Bashshur (1976; 1983) and Lovett and Bashshur (1979) – are general accounts of telemedicine but stand apart because they were written around the time of early telemedicine research. The context within which they were written is therefore quite different to the context within which later accounts were written and this is reflected in the narratives that these early texts deploy (more on this later).

Reflexions: *More on Method*

In Chapter 2, I wrote that this account of telemedicine's histories would be written in a pinboard mode. One of the justifications for this was to familiarise the reader with the approach prior to working on the core empirical chapters. This is true but there is another side to that point: I used this Chapter to familiarise myself with the pinboard method as well. So, as this chapter introduces the pinboard in practice for the first time, here is a brief account of what I did to produce it.

Though I was already very familiar with the texts I was working with (see below) my starting point was to work through each one of them again with a view to identifying their key features. In an exercise similar to coding, after working through each text I wrote a short summary of its features on a piece of paper and labelled both the description and account with a number. The text was then deposited on the floor. If a text matched one of the descriptions I had already written, then it was given the same number and placed with the texts which shared that number. Thus, as I worked my way through the texts I began to produce a pinboard on the floor while the list of summaries I kept allowed me to keep track of what was what.

In the end, out of the forty texts that are used in this Chapter, I produced around twenty different groupings. Many of the groupings were occupied only by a single text as one grouping in particular – "cost to maintain, technological shortcomings and bulky equipment outweighed benefits" – was highly populated. When it came to writing, I primarily made use of the notes I had made rather than the spread of papers on the floor as the list was sufficiently manageable that I could read and rearrange things on it instead.

In producing my summaries, I was at pains not to draw an equivalence between two texts unless the differences between them were negligible. Nevertheless, I believe it would have been possible for me to have been more 'fine grained' in my allocation of each text, especially with regards to the group which was highly populated. In the end, however, the demands of space made it necessary for me to cut some of the less significant distinctions between texts, therefore it is unlikely that much if anything was lost as a result of my allocation strategy.

Now, a caveat:

More than any other part of the thesis, this Chapter has undergone considerable revision owing to the frequent reformulations of the objectives of the study. An initial pool of texts was generated more or less at the start of my research through use of web-based search engines and bibliographic tracing. I used this literature to develop an understanding not only of existing histories of telemedicine, but early US telemedicine itself as these histories were my first encounter with it.

For some time, the purpose of this Chapter was to develop a critique of these texts so as to produce a space for an alternative account (informed, variably, by Neoinstitutional theory and later ANT). Hence, my initial reading of those texts was undertaken with a critical eye and focused on their shortcomings and failures. My analysis led me towards the following conclusions. Firstly, with the exception of Park (1974) and Bashshur and Shannon (2009), existing accounts of early telemedicine lack any significant scope or detail. Secondly, the accounts overwhelmingly focus upon the technologies of telemedicine systems above all else. Thirdly, they largely draw from only a small pool of early telemedicine projects, in particular the projects in Massachusetts and Nebraska along with NASA's STARPAHC project. Fourthly, the accounts almost always articulate telemedicine in terms of a progressive trajectory from unreliable, expensive and ineffective technology in the 1960s and '70s to sophisticated applications in the present day. And, fifthly, this trajectory also typically takes on a teleological character with texts looking to the future of telemedicine and the benefits it will (supposedly) bring.

Since my initial analysis and writing, the purpose of this thesis has changed considerably. Most importantly, the thesis no longer situates itself in opposition to other accounts of early telemedicine and therefore has no interest in criticising or deconstructing them. Nevertheless, this early work has cast a long shadow and in re-analysing the texts for this final draft, I found that I was unable to shake off my previous interpretations of them. Hence, while I was no longer articulating them as problematic (just different) I found that my attention was drawn to the same issues that I had sought out when first I began to read them. My preliminary, critical, analysis of these histories has therefore carried through somewhat to the Chapter's final form.

Group	Overview	References
General Accounts	Accounts of early telemedicine presented in texts unconcerned with early telemedicine itself. Usually deployed to provide some context or background about telemedicine before turning to the main substantive issue of the text.	- Bashshur (1997) - Brennan et al. (2008) - Chaffee (1999) - Clark et al. (2010) -Grigsby and Kaehny (1995) - House (1999) - Jerant, (1997) - Li (1999) - Mizushima et al. (2000) - Norris (2002) - Ricke and Bartelink (2000) - Rossen and Simpson (2001) - Rosser et al. (2007) - Scalvini et al. (2004) - Strehle and Shabde (2006) - Tulu and Chaterjee (2005) - Yellowlees (1997) - Zundel (1996)
Historical Accounts	Texts written from the 1990s onwards concerned with presenting an overview of the history and development of telemedicine. Accounts of early telemedicine feature as the first of several 'stages', 'waves' or 'eras' of telemedicine development.	- Barrett and Brecht (1998) - Braunstein (2007) - Breen and Matusitz (2010) - Cipolat and Geigas (2003) - Houston (2012) - Garshnek and Burkle (1999) - Kayser et al. (2011) - Koch (2006) - Kuo et al. (2001) - Merrell (2004) - Moore (1999) - Nestor (2001) - Nicogossian et al. (2001) - Picot (1998) - Thrall (2007) - Whitten and Sypher (2006)
Accounts of Innovation	Texts also written from the 1990s onwards and concerned with the history and development of telemedicine. Unlike other historical texts, these accounts are concerned with building or testing theoretical or conceptual accounts of innovation.	- Mun and Turner (1999) - Whitten and Collins (1997)
Original Accounts	A small number of texts written contemporaneously with early US telemedicine providing an overview of telemedicine work in the 1960s and '70s. These texts all work to advocate telemedicine research and practice.	- Bashshur (1976) - Bashshur (1983) - Bashshur and Lovett (1979)
Detailed Accounts	Two books which offer extensive accounts of early telemedicine. The latter (Bashshur and Shannon, 2009) draws in places quite heavily on the former (Park, 1974)	- Bashshur and Shannon (2009) - Park (1974)

Table 3.1: Summary of Early Telemedicine Accounts

The final two – Park (1974) and Bashshur and Shannon (2009) – stand apart instead as a result of their considerably larger scope. The first of these, Ben Park's (1974) *Introduction to Telemedicine*, is the first ever book published on the subject of telemedicine and was written contemporaneously with early telemedicine research and practice. The second, Bashshur and Shannon's (2009) *History of Telemedicine*, is on the other hand much more recent and stands as the most extensive account of telemedicine's history and development to date.

Aside from the context within which each of these histories is situated, there are several further points which can be made. Firstly, these histories vary considerably in terms of their length and quality. Most are very brief – a few paragraphs at most – but a small number extend over several pages of an article or, in the case of both Bashshur and Shannon (2009) and Park (1974), constitute entire chapters. Secondly, few of these histories are based upon original research. Most instead draw upon secondary sources or personal experience. Again, Bashshur and Shannon (2009) and Park (1974) are key exceptions. Thirdly, none of the histories considered in this Chapter were written by persons uninvolved in telemedicine or medical practice. Medical practitioners constitute the majority of authors, while the rest are either social or health scientists who have in some way been involved in telemedicine research or practice.

Structuring Histories of Telemedicine

Whatever differences there may be between them, histories of early telemedicine are structured very similarly. On the one hand, they work through cases, describing (in whatever detail) individual telemedicine projects established and operated during the 1960s and '70s. On the other hand, they also work through summation, presenting overviews of early telemedicine research and practice as a whole. Histories of early telemedicine are therefore comprised of two juxtaposed elements. Through describing individual instances of early telemedicine, they present what might be described as an 'a-narrative' account lacking any kind of storied structure. Yet through their summations, the early telemedicine period as a whole is tied into a broad narrative of evolution and development. In this section, both these elements are examined.

Cases

Almost all accounts of early telemedicine present a description – however brief – of one or several early telemedicine projects. For example:

> **Exhibit 3.1:** "It was in 1959 when Wittson and colleagues performed telepsychiatry consultations using two-way interactive television by microwave between centres located 112 miles apart in Nebraska. Shortly thereafter, Junta et al… transmitted angiographic images from a fluoroscope by coaxial cable at Quebec in Canada. Perhaps the first experience, however, occurred in 1917, when Holland performed teleconsultation for severe pelvic injuries using the telegraph system in Western Australia... In 1968, Massachusetts General Hospital started telemedicine services including telepathology to Logan Airport to treat and evaluate ill travellers. Randall et al… of University of Washington carried out medical consultation on a boy with lymphosarcoma aboard a hospital ship via a communications satellite" (Mizushima et al., 2000: 3)

Exhibit 3.1 is an exemplar of the way in which accounts of early telemedicine are structured. First, it is constituted by a (very selective) list of early telemedicine projects. Each project is described independently from the others and there are no connections drawn between them beyond the fact that they are all examples of telemedicine. Second it offers some small amount of explication of those projects, although this description focuses largely on the technologies employed and the uses of those technologies.

While the account presented in Exhibit 3.1 is very brief, more detailed accounts nevertheless possess a very similar structure. For example:

> **Exhibit 3.2:** "[Early telemedicine projects in the 1970s] used a number of communications technologies: microwave, broad band television, picture-phone using switched networks, and cable television. Medical consultation, formal medical education, continuing education, and administrative applications were among the variety of services provided.
>
> "The launching of US government-supported telecommunications satellites provided the first widespread opportunities for telemedicine experimentation. In the 1970s ATS satellites provided multifaceted, federally supported telemedicine experiments. WAMI connected rural areas of Washington, Alaska, Montana and Idaho with the University of Washington in Seattle using the ATS-6 satellite. Besides providing speciality consultation, the WAMI project was one of the first experiments to provide medical undergraduate and continual education to isolated rural physicians.

> "STARPAHC was primarily a telemedicine health delivery system using slow-scan television provided through microwave connections to the Pagago Indian Reservation outside Tucson, Arizona. The service emphasized the use of nonphysician health care providers and portable equipment" (Moore 1999: 247)

On the one hand, it is possible to differentiate between Exhibit 3.2 and Exhibit 3.1 by virtue of the former's superior depth. While it is still cursory, Exhibit 3.2 nevertheless explicates some further features of the systems it describes which were absent in Exhibit 3.1. On the other hand, however, the account very much possesses the same basic structure. It is still a list of early telemedicine projects and it is different *only* because it offers some additional description of them.

Precisely the same format is found in even the most extensive accounts of early telemedicine (i.e. Park, 1974 and Bashshur and Shannon, 2009). While their accounts describe a comprehensive range of early telemedicine systems, and while they are explicated more thoroughly, they are both nevertheless extensive lists of early telemedicine projects described in turn and independent of one another.

Histories of early telemedicine, then, are overwhelmingly constituted by what might be described as annotated lists of early telemedicine systems. But while accounts of early telemedicine focus on describing individual cases, the range of cases they tend to describe is relatively narrow. This is evident in the examples above, which describe only a handful of the projects established and operated in the US during the 1960s and '70s. But, on aggregate, only a fairly narrow selection of cases is drawn upon as well. Here is another account:

> **Exhibit 3.3:** "Perhaps the first telemedicine program, funded by the National Institute of Mental Health, linked Norfolk State Hospital to the university of Nebraska Schools of Medicine… In 1967, an interactive network was established between Boston's Logan Airport and Massachusetts General Hospital… with funding from the U.S. Public Health Service. Through the early 1970s, programs were established in both urban and rural areas, providing consultation for jails, nursing homes… and other venues.
>
> "One of these programs was called Space Technology Applied to Rural Papago Advanced Health Care (STARPAHC). STARPAHC was funded by NASA, equipped by Lockheed, and implemented on the Papago Indian reservation in Arizona with the cooperation of the Indian Health Service and the Papago people. STARPAHC used telecommunications

technology developed to enable NASA to monitor the physiological functioning of astronauts in space… in conjunction with mobile health units. The project demonstrated the feasibility of using advanced technology to bring medical services to remote areas" (Grisgby et al. 1995: 4)

In Exhibit 3.3, explicit reference is made to three early telemedicine projects: Nebraska; Massachusetts; and STARPAHC. All three of these early telemedicine projects have been encountered already in Exhibits 3.1 (which refers to the Nebraska and Massachusetts systems) and 3.2 (which refers to the STARPAHC system). Exhibit 3.4 is similar:

Exhibit 3.4: "In the late 1950s the Nebraska Project was started in Omaha, Nebraska (USA) in which an interactive, closed-circuit TV was set up between two hospitals located more than 150 km apart. Using a black-and-white TV monitor, doctors conducted interviews with psychiatric patients.

"Fuelled by the 'space race', NASA… became a driving force behind a number of other telemedicine projects in the 1960s and 1970s. The advent of manned space flight made it necessary to be able to provide medical assistance in outer space. Using telemetric data transmitted from the astronauts' spacesuits, medical personnel in ground control were able to continuously monitor physiological parameters such as heart rate, blood pressure, and ECG signs" (Wurm et al., 2008: 107)

Here, the Nebraska telemedicine system is referred to again, along with – in general terms – the telemedicine research undertaken by NASA (which includes STARPAHC and the WAMI project outlined in Exhibit 3.2). Like the other accounts, Exhibit 3.4 reduces early telemedicine to only a small number of projects, but also reduces it to (more or less) the same group of projects as well.

In accounts of early telemedicine, then, there is a core group of US telemedicine projects which feature prominently, namely the Nebraska and Massachusetts systems and the telemedicine research done by and in conjunction with NASA. To be clear, these are not the only early telemedicine systems which are described in the literature, and the most extensive accounts (i.e. Park, 1974 and Bashshur and Shannon, 2009) offer a description of almost all early US telemedicine projects. However, on aggregate, this literature performs and therefore reduces early telemedicine to a small number of examples. These few cases –

Nebraska, Massachusetts and NASA – implicitly stand in for early telemedicine practice in general. Accordingly, accounts of early telemedicine implicitly erase much of the variety and heterogeneity of early telemedicine by rendering many projects more or less absent.

An Aside: *Three Explanations*

It has been written in the main text that there are three early telemedicine projects – Nebraska, Massachusetts and STARPAHC – which are especially prominent in accounts of early telemedicine. Here are some possible explanations for why that is.

Exceptionalism

Firstly, and most simply, each of these projects can be described as exceptional. The Nebraskan telemedicine system is frequently hailed as the first true telemedicine system to have been founded. The Massachusetts system was also a pioneer and the term 'telemedicine' originates from its designers. And while STARPAHC was one of the last early telemedicine projects to run, it was also the most extensive and costly and was the only early US telemedicine project to be documented and reported on extensively (see Bashshur, 1980).

Traces

A second explanation is that the privilege these projects enjoy results from the traces they have left. Together, the telemedicine systems in Nebraska and Massachusetts produced much of the published literature on telemedicine in the 1960s and '70s. By comparison, many of the telemedicine projects funded by the Health Care Technology Division (HCTD) and National Science Foundation (NSF) in the early 1970s produced very little. Indeed, many of these projects are detailed only in the books authored/edited by Park (1974) and Bashshur et al. (1975) or in Rockoff's (1975) overview of the HCTD's telemedicine projects. As such, there is a much more extensive record of the research done at Nebraska and Massachusetts than any other telemedicine project from the period.

Legacy

A third explanation points towards the legacy left by the earliest histories of telemedicine. Lovett and Bashshsur's (1979) overview of US telemedicine is one of

the most commonly cited papers from the early telemedicine period. Yet their paper only explicitly details two telemedicine projects from the 1960s and '70s: Nebraska and STARPAHC. Other texts written by Bashshur around the same time (e.g. Bashshur, 1980; Bashshur, 1983) also reflect his work with STARPAHC. These texts are significant because, in turn, they are cited in Grigsby et al.'s (1995) history of telemedicine which itself is cited in many other accounts of early telemedicine. Hence, there is a chain of references that can be traced back to these initial histories of telemedicine written by Bashshur.

I have no particular interest in choosing between these explanations and I have written them in a more or less pinboard manner to reflect that. Instead, what I want to suggest is that perhaps the answer lies between the three explanations. Perhaps the explanation is fractional too. The case study in Chapter 6 will carry this thought further.

Summations

On the one hand, then, accounts of early telemedicine work though outlining individual cases of telemedicine practice. But on the other hand these accounts also work through the production of general summary statements about early telemedicine as a whole. In some instances, such summations constitute the entirety of an account. For example:

> **Exhibit 3.5:** "The relatively short history of telemedicine from the 1960s onwards is characterised by many different types of system, relatively few of which have endured beyond a few years. Typically, telemedicine systems have been started by charismatic clinicians who have had single applications and a great deal of energy. These project leaders have frequently been able to convince government or commercial authorities to allocate short-term funding, often very substantial. However, few have been able to convince their funding course to continue funding beyond two three [sic.] years, and fewer still have managed to embed their telemedicine systems into the normal clinical service-delivery mechanisms" (Yellowlees, 1997: 1)

Exhibit 3.5 performs a different history of telemedicine when compared with the project-listings outlined above. For starters, it is an overview. While it states that there have been in fact many varied telemedicine projects since the 1960s, the text in fact works to bundle these together into a singular entity. Secondly, the Exhibit focuses on issues quite different to those presented above. Rather than outlining the content of early telemedicine projects, Yellowlees's account offers instead a brief description of how these projects were set up and (not) maintained. As such – and this is a third difference – Exhibit 3.5 constitutes a more or less narrative-style account of early telemedicine. It tells a story: early telemedicine projects were set up primarily by charismatic clinicians, but these early projects eventually folded as these clinicians were unable to secure long-term funding.

Another example:

> **Exhibit 3.6: "**While it seems almost quaint today healthcare prior to the early 1980s was provided almost entirely under 'fee-for-service' payment. Physicians, hospitals and home care agencies charged someone – the government, an insurance company or the patient – whatever they felt was needed to cover their costs plus, where called for by their business model, a profit…
>
> "It isn't surprising, therefore, that the earliest ideas about telemedicine were based on improving or increasing the delivery of services. To accomplish this objective the goal was the 'televisit'. An article by K. T. Bird in 1975 describes telemedicine as 'the practice of medicine without the usual physician-patient physical confrontation via an interactive audio-video communication system" (Braunstein, 2007: 1)

The account presented in Exhibit 3.6 is both similar and dissimilar to the account presented in Exhibit 3.5. On the one hand, it explicates telemedicine quite differently, focusing upon the relationship between early telemedicine and pre-1980s US health economics. On the other hand, however, it draws early telemedicine together. As in Exhibit 3.5, telemedicine is not performed as a heterogeneous collection of different experiments, trials and applications but as a singular object, unified in this instance by its relationship to health economics.

These kinds of account, then, stand in marked contrast with the accounts presented in Exhibits 3.1-3.4. While those accounts were focused upon describing individual telemedicine

projects, the accounts in Exhibits 3.5 and 3.6 describe early telemedicine as a singular whole. And if the accounts in Exhibits 3.1-3.4 implicitly reduced early telemedicine to a small number of well-known projects, then the reduction in Exhibits 3.5 and 3.6 is even more complete. Heterogeneity is all but erased; out of the array of early telemedicine projects a single, coherent 'Telemedicine' is formed.

But while these different kinds of account are sometimes separate, they are also commonly found together in the same text. For example:

> **Exhibit 3.7:** "In the 1970s, there was a flurry of telemedicine activity as several major projects developed in North America and Australia, including the [STARPAHC] project… in southern Arizona, a project at Logan Airport in Boston, Massachusetts, and programs in northern Canada…
>
> "The first wave of telemedicine activity spanned a 40-year period from the 1950s through current applications. What is unique about this generation of activity is the focus on real-time videoconferencing versus asynchronous store-and-forward modalities. As technological innovations were translated from the bench to the field in the 1990s, the focus began to shift towards technological advancements that privileged the information being transferred" (Whitten and Sypher, 2006: 593)

Exhibit 3.7 demonstrates a shift from one kind of account to the other. In the first paragraph, Whitten and Sypher produce an account very much akin to the accounts presented in Exhibits 3.1-3.4. In the second, however, the authors move towards a summation of early telemedicine similar to those outlined in Exhibits 3.5 and 3.6. What is more, there is no explicit connection between these two accounts. The authors do not, for example, use their outline of different telemedicine projects to evidence the summation made in the second half of the Exhibit, nor do they use their outline of cases to demonstrate exceptions to that summation. These two accounts, therefore, are more-or-less independent of one another even while they are written as part of the same text.

Histories of telemedicine, therefore, are frequently constituted by two juxtaposed elements. On the one hand, they present (more or less) detailed descriptions of different telemedicine systems. But on the other hand, they erase through summation the differences between these systems and perform instead a single cohesive 'Telemedicine'. The former practice is more or less a-narrativistic: described on their own terms, there is no attempt to render

these projects coherent with one another, to connect them, to draw comparisons, or otherwise bundle them together. Very loosely, then, they might be described as performing pinboards of early telemedicine! Nevertheless, through summations these accounts introduce narrative, coherence and ordering. Through summations, early telemedicine systems are bundled and grouped together as a single entity. And, as will be demonstrated later, they are often bundled as part of an overarching narrative of telemedicine development.

Reflexions: *On Hypocrisy*

> "Histories of telemedicine… are frequently constituted by two juxtaposed elements. On the one hand, they present (more or less) detailed descriptions of different telemedicine systems. But on the other hand, they erase through summation the differences between these systems and perform instead a single cohesive 'Telemedicine'"

These are my words. They are critical words, or at least can be read that way. Histories of telemedicine, so I assert, flirt with heterogeneity but in the final analysis fail to perform it. Instead, they trade in simplicities, reducing the heterogeneity of early telemedicine to a single general theme or feature. They therefore erase differences, leaving only the homogenous and monolithic 'Early US Telemedicine' in all its generality.

But here is the problem: in this Chapter, I enact precisely the same kind of oscillation. On the one hand, I present and describe individual examples of histories of telemedicine. But on the other hand, I summate this literature using a generalising language. "Most," "many," "often," "majority," and "commonly" are all deployed throughout this Chapter. Each time, this heterogeneous literature is reduced to a small set of concerns or ideas. And, implicitly, anything which does not fit is erased.

What is worse, here, is that while the histories of telemedicine currently under examination do not purport to do otherwise, I – supposedly! – am using a method of analysis designed specifically to resist the kinds of reduction that are nevertheless performed throughout this Chapter. It is possible, perhaps, to justify this. For sure, the generalising statements are true enough. 'Most' accounts of telemedicine *do* oscillate between two modes of telling; it is 'typically' asserted that interactive television constituted the first real instances of telemedicine practice; and so on.

I am uncomfortable with this justification, though, for in principle it could be resolved through a discussion of the exceptions that I am casually erasing (and exceptions there must be, or else I should be writing 'all' rather than 'most' and 'always' rather than 'typically'). In turn, it could be argued that there is insufficient space to develop such an account here (which returns to the problem of 'stopping' outlined at the beginning of Chapter 1). But that is not an argument I am happy with, since the point here is to illustrate the pinboard method in full.

I suspect it would be possible to rewrite this Chapter in such a way that these problematic elements were removed, since the loose quantification that is performed through those generalising statements is not critical to the argument outlined. But having now enacted this 'slippage' I have decided to leave it be. Treat it as a cautionary tale: old habits are not so easily undone.

Enactments of Telemedicine in History

Turning away from structure, the following section is concerned instead with the various enactments of early telemedicine which are performed through its histories. Again, these histories demonstrate both similarity and difference. On the one hand, descriptions of telemedicine's origins and analyses of early telemedicine systems are very broad in terms of the accounts produced. Nevertheless, histories of telemedicine as a whole are highly techno-centric, performing telemedicine almost exclusively as an arrangement of technological artefacts. Each of these aspects will be examined in turn.

The Origins of Telemedicine

Among histories of early telemedicine there is no shortage of accounts of telemedicine's origins. Exhibit 3.8, which describes Bell and Watson's invention of the telephone, is one example:

Exhibit 3.8: "On March 10, 1876 Alexander Graham Bell spilled battery acid on himself and summoned his assistant, Thomas Watson, saying 'Mr Watson, come here, I want you!' History records that Mr Watson heard Bell's voice through the wire of the telephone system that they were in the process of inventing, thereby signalling the

simultaneous beginnings of telephony and telephone-based telemedicine – a summons for help with a medical emergency" (Thrall, 2007: 613)

In this account, the author describes telemedicine and the telephone as being invented simultaneously, with telemedicine a naturally occurring consequence of telephonic communication. This account therefore renders telemedicine synonymous with modern telecommunications technology, a synonymy which is emphasised further in the following paragraph where Thrall writes:

Exhibit 3.9: "In the ensuing 130 years from the invention of the telephone, every new method of communication has been explored for use in telemedicine applications" (Thrall, 2007: 613)

Other accounts have also linked the origins of telemedicine to the invention of the telephone, though without the 'heroic' story which is narrated by Thrall:

Exhibit 3.10: "The existence of telemedicine can be traced to the first uses of the telephone. For example, in 1877, 21 doctors practicing in adjoining areas built one of the first telephone exchanges to allow easier communication with a local drugstore" (Mun and Turner, 1999: 591)

On the one hand, Mun and Turner's account in Exhibit 3.10 performs telemedicine in a manner similar to Thrall in Exhibits 3.8 and 3.9, as both link the emergence of telemedicine to telephonic communication. Nevertheless, there is a significant difference in the narrative which supports these two accounts. Thrall's account deploys a narrative of inventive heroism by centring Bell and Watson, as well as by narrating a dramatic (if mythical – see Bashshur and Shannon, 2009: 4) occurrence which heralded the first successful telephonic communication. In contrast, Mun and Turner's account is quite mundane. Rather than centring specific individuals, it makes reference only to an anonymous group of physicians, while the first telemedicine application is not described as a dramatic cry for assistance, but a

rather ordinary organisational arrangement. If the two accounts perform similar versions of telemedicine, then, they perform quite different versions of history and innovation.

Other accounts of the origins of telemedicine look to earlier inventions than the telephone. Exhibit 3.11 is one such account which describes briefly the use of telegraphic communication during the American Civil War to coordinate the deployment of medical supplies:

> **Exhibit 3.11:** "The use of the telegraph quickly spread… During the American Civil War, the telegraph was used extensively to issue commands to troops on both sides of the conflict and to report troop movements. More importantly, it was also used to report casualty lists and to secure scarce medical supplies." (Houston et al., 2012: 197)

Although it is too long to present here, Eikelboom (2012) also describes the use of telegraphic communication as the first instance of telemedicine practice via a story about medical assistance provided to survivors of a native Australian attack. But the origins of telemedicine have been taken back further still:

> **Exhibit 3.12:** "Technological advances of the last five centuries have allowed healthcare providers to transmit greater amounts of information at exponentially increasing rates. Johannes Gutenberg's invention of the printing press in 1451 allowed healthcare providers to disseminate information en masse" (Cipolat and Geigas, 2003: 6)

Accounts of telemedicine's history, then, point towards a variety of different technologies as being the telemedicine's origin point. Nevertheless, there are a few common implications which can be drawn out. Firstly, all these accounts perform telemedicine in its broadest sense, that is, as "medicine across distance" (Barrett and Brecht, 1998: 9; also see the Introduction above). This is in contrast to other definitions of telemedicine which emphasise particular kinds of telecommunications technologies such as television or computing technologies as constitutive of telemedicine practice. Secondly, all these accounts in Exhibits 3.8-3.12 perform telemedicine as *venerable.* In other words, they do not enact telemedicine as a new concept but instead enact it as having a long – if implicit – history in medical care practice. Hence – and this point will be returned to later – these origin stories help to

perform *contemporary* telemedicine as an outcome of long-term historical processes of development in telecommunications technologies.

While the examples presented in Exhibits 3.8-3.12 point towards relatively old telecommunications technologies as being the origins of telemedicine, other accounts of telemedicine's history point towards more recent telecommunications technologies instead. For example, in Exhibit 3.13 the earliest of telemedicine application is described as a radio service providing medical assistance to seafarers:

> **Exhibit 3.13:** "The first example of telemedicine in its broadest sense occurred in the 1920s when physicians on shore used ship-to-shore radio to communicate medical information to those at sea" (Moore, 1999: 247)

As well as pointing towards a different kind of technology as the origin-point for telemedicine, however, the account in Exhibit 3.13 implies a different conceptualisation of telemedicine altogether when compared with Exhibits 3.8-3.12. The system that Moore describes here is a system that is specifically designed to provide health care services, which contrasts with the more general 'medicine at a distance' which was performed previously. Hence, through her description of the origins of telemedicine, Moore enacts telemedicine as a deliberately designed telecommunications infrastructure for providing health services, rather than the ad hoc use of telecommunications infrastructure which characterised previous examples of telemedicine.

> **Exhibit 3.14:** "If one applies the literal definition of telemedicine as 'medicine at a distance,' with the assumption that telecommunications technology is used to assist in healthcare treatment, then many examples of 'early' telemedicine emerge. Einthoven, the developer of the electrocardiogram, was transmitting heart tracings via telephone wire from the hospital to his laboratory as early as 1906… Ships at sea also have an extensive history of using radios to obtain medical advice" (Cipolat and Geigas, 2003: 6)

The account in Exhibit 3.14 performs telemedicine in two different ways simultaneously. On the one hand, telemedicine is explicitly defined in its general sense as 'medicine at a distance'. On the other hand, however, a more specific version of telemedicine is performed in the

actual examples given. By describing only systems that were deliberately implemented to provide health care, in practice the version of telemedicine that is performed here is closer to the version performed by Moore's account in Exhibit 3.13 than the accounts in Exhibits 3.8-3.12. By moving between these two versions freely, telemedicine is performed as a fluid object (Mol and Law, 1994; Mol and de Leat, 2000; also see Chapter 1).

This notion of telemedicine as a specially-implemented system is extended further in Exhibit 3.15 which asserts that the two-way CCTV experiments undertaken at the Nebraska Psychiatric Institute constituted the first true telemedicine applications:

> **Exhibit 3.15:** "Even though much debate has surrounded the 'what, how, when and where' of the first official and *real* telemedicine services, the earliest cited application… occurred in 1959. Through the use of intensive research into the history of telemedicine, literature… has shown that this first telemedicine study was designed and later conducted to illustrate the advantages of a unique form of telecommunication in a psychiatric context. Specifically, the use of a two-way closed-circuit microwave television system enabled successful telemedicine communication, education, and research between the Nebraska Psychiatric Institute and Norfolk State Hospital in Nebraska" (Breen and Matusitz, 2010: 61)

As above, Breen and Matusitz's origin story associates telemedicine with more recent telecommunication technologies. But their account also performs telemedicine as a research field and, more importantly, as the routine use of telecommunications technology in everyday healthcare service provision. In Exhibit 3.15, then, telemedicine is enacted not simply as telecommunications technologies deployed for medical purposes, but as a *system of routine health care*. Again, this contrasts with the other accounts presented in Exhibits 3.8-3.14, all of which describe ad hoc uses of telecommunications technologies or applications distinct from routine, systemic health care services.

In spite of all of these many accounts of telemedicine's origins, it is typically asserted that the telemedicine research which began in the 1950s and '60s using television technologies constituted the first 'true' examples of contemporary telemedicine. This was the case in Exhibit 3.15 above. However, the exclusion of previous practices that might have been described as telemedicine in that Exhibit is implicit. In contrast, Merrell's account in Exhibit 3.16 explicitly acknowledges the use of telephonic communication to provide health care

services prior to the 1950s, but in spite of this proceeds to describe trials undertaken at the Nebraska Psychiatric Institute as the "first telemedicine project":

> **Exhibit 3.16:** "Telemedicine may be defined as the use of telecommunications and information technology to support delivery of health care at a distance. Certainly the telephone is a tool which satisfies this definition and has been employed throughout the 20th century to connect physicians and other caregivers with patients with advice and instruction. However, the notion of telemedicine took on a radical new definition with the use of videoconferencing between patient and health system. The Nebraska Psychiatric Institute instituted closed circuit television in 1955 for patient care and may be considered the first telemedicine project" (Merrell, 2004: 4)

In this origin story, then, a distinction is made between the use of telecommunications technologies to provide health care services and telemedicine specifically. While the use of other technologies is referred to, it is only with the use of television that telemedicine is said to have emerged. This story therefore performs telemedicine quite narrowly as the use of particular kinds of technologies (especially audio-visual ones). Hence, Merrell's account stands opposite to the accounts presented in Exhibits 3.8-3.12, which all enacted telemedicine in its broadest sense.

From the above, it is possible to see that 'early telemedicine' is not something which can be taken for granted. There are a wide array of different stories regarding the origins of telemedicine which attribute it to quite different times and places and which perform it in quite different ways. Some of these stories enact telemedicine as part of the long-term development of telecommunications technology, while others attribute it to specific, recent telecommunications innovations. Some perform telemedicine very broadly as any use of telecommunications technology in medical practice, while others perform telemedicine as the systemic use of telecommunications technology in everyday, routine health services. And so on. Nevertheless, all of these origin stories share a common feature: they *all* privilege technology as central to telemedicine practice. It is this performance of telemedicine that is explored in the following section.

Enactments of Telemedicine as Technology

The origin stories outlined above all in some way relate the emergence of telemedicine to particular developments in telecommunications technologies. While the technologies in

question vary between accounts, technology itself remains central. This emphasis upon technology is not limited to stories about telemedicine's origins, however. Accounts of early US telemedicine are in fact highly techno-centric, focusing their descriptions primarily upon the technological aspects of early telemedicine systems.

In some instances, as is demonstrated in Exhibit 3.17, this techno-centric performance of telemedicine is rendered quite explicit:

> **Exhibit 3.17:** "When a topic so synonymous with advanced technology as telemedicine needs a written history, perhaps a discipline has come of age" (Merrell 2004: 4)

This Exhibit performs telemedicine in two related ways. On the one hand, telemedicine is performed as being constituted by technology through and through via the assertion that telemedicine is "synonymous" with advanced technology. On the other hand, however, this synonymy of telemedicine and advanced technology is itself deployed to perform telemedicine as an established field since – this is Merrell's argument – the ability to write a history of advanced technology is indicative of that technology's maturity. In other words, through enacting telemedicine as a technology Merrell performs a (very implicit) narrative of telemedicine's development which asserts that it has become a well-established discipline by virtue of it now having a written history.

The explicit enactment of telemedicine as technology is also demonstrated in Exhibit 3.18:

> **Exhibit 3.18:** "Telemedicine can be broadly defined as the use of telecommunication technologies to facilitate the delivery of health care at a distance. This definition includes the integration of a wide range of technologies and applications" (Mun and Turner, 1999: 590)

Again, telemedicine is rendered synonymous with telecommunications technologies. And again, this performance of telemedicine as a technology is deployed to perform a narrative of telemedicine's development:

> **Exhibit 3.19:** "Technology is defined as a scientific method of achieving a practical purpose. However, technology undergoes several stages of evolution before it is adopted and applied to achieve its practical goals. As these stages evolve, the potential of the technology is unleashed. The communications age has brought with it the powerful potential for many applications which will transform the way we work, learn and live. Healthcare is one specific industry that is witnessing an interesting transformation through the integration of these telecommunications technologies" (Mun and Turner, 1999: 590)

Together, Exhibits 3.18 and 3.19 work to produce an implicit narrative of telemedicine's history and development. If telemedicine is a technology, and if technologies evolve through stages before they are generally adopted and implemented, then telemedicine's history must be comprised of various stages of evolution. This narrative in fact serves as a framework for the latter half of Mun and Turner's paper in which they explicate several stages of telemedicine's evolution. The enactment of telemedicine as a technology is therefore crucial to the narrative that Mun and Turner construct, although in describing telemedicine in terms of a model of technological innovation this narrative also helps perform telemedicine as a technology.

In spite of these explicit enactments of telemedicine as technology, it is more common for accounts of early US telemedicine to perform such an enactment implicitly instead. Exhibit 3.20 – a representative excerpt from Nestor's (2001) history of early telemedicine – is a clear example:

> **Exhibit 3.20:** "The term telemedicine was coined in the late 1950s [sic.] by Drs. Kenneth Bird and Thomas Fitzpatrick of Massachusetts General Hospital (MGH), who, in cooperation with the Raytheon Corporation, set up a microwave video and closed-circuit television link between MGH and a health care station at Boston's Logan Airport... Technological advances did not improve until the late 1980s and early 1990s. The field of radiology contributed the most effective advances: innovations in communications technologies centred on computer networking, networking technologies, and scanned image resolution" (Nestor, 2001: 379)
>
> "The central theme of the early implementation of telemedicine technologies was severalfold. Communications technologies were a closed-circuit looped to the

participating locations, meaning that expansion and initial implementation of the circuit was both expensive and time-consuming. The early telecommunications technology usually was microwave-based signals emanating from satellites. The communications were sometimes spotted with errors and signal disconnections and lacked a communication redundancy layer in the event of primary communications failure." (Nestor, 2001: 380)

Exhibit 3.20 strongly focuses on describing the technological elements of early telemedicine. Aside from the people involved, the only thing one learns about the Massachusetts General Hospital telemedicine system is that it operated using microwave and closed-circuit television. The development of telemedicine beyond this initial system is described in terms of technological advances. The second paragraph rolls 'telemedicine' and 'technology' together in the first sentence and proceeds by describing a number of technological issues and problems. In other words, the performance of telemedicine as technology thoroughly permeates almost every sentence of Nestor's account.

That Exhibit 3.20 is so thoroughly focused on technology is not especially surprising, since Nestor's paper is concerned with examining the simultaneous development of telemedicine and Internet technologies. But this focus on technology is found in other accounts too:

Exhibit 3.21: "Prototypical telemedicine systems were developed almost 40 years ago. The first use of telemedicine occurred in 1959 at the University of Nebraska, utilizing microwave signal technology. Other early models included a video system that connected Massachusetts General Hospital with a clinic at Boston's Logan International Airport. In general, these early systems allowed live interaction between physicians and patients utilizing closed-circuit television.

"Unfortunately, these systems were destined to fail for a number of reasons. Most important was the cost of maintaining such systems. At the time, information could be sent only be telephone lines in an analog fashion, where all of the data are encoded into corresponding voltage waveforms. To generate high-resolution analog images, the signal frequency must be maximised. As a result, the equipment required to sustain signal transmissions was complex and bulky. In addition, the equipment was extremely expensive and difficult to maintain. These disadvantages outweighed any potential benefit that was provided through the early telemedicine systems" (Kuo et al., 2001: 63)

As in Exhibit 3.20, this account thoroughly constitutes telemedicine as a technology. The two telemedicine systems described in the first paragraph are described only in terms of the technology which underpinned them, while the failure of early telemedicine is explained exclusively by reference to technological problems and shortcomings. Indeed, through focusing upon the technological shortcomings of early telemedicine, the authors are able to construct a narrative of telemedicine's development which emphasises the technological changes which overcame those limitations:

> **Exihibit 3.22:** "The development of telemedicine stagnated throughout the 1970s and early 1980s, as cost issues continued to hamper new projects. However, two major advances in technology, digital imaging and the Internet, would have profound influences on current telemedicine systems" (Kuo et al., 2001: 63)

In Exhibits 3.21 and 3.22, then, telemedicine and its history are rendered contingent upon developments in telecommunications technology. Better, telemedicine and its history are *reduced* to the development of telecommunications technology.

It is this notion of 'reduction' which is critical. If accounts of telemedicine's early history have enacted telemedicine as a technology then they have done so with good reason, for it is impossible to envisage telemedicine without the use of telecommunications technology. Nevertheless, as will be demonstrated in Chapter 4, early US telemedicine was much more than video cameras, television monitors and copper wires. Hence, for all that telemedicine has and continues to be thoroughly constituted by technological artefacts, technology is nevertheless only one of many realities of telemedicine. And yet those other realities are frequently rendered invisible.

One final example, taken from Mun and Turner's (1999) account already discussed above:

> **Exhibit 3.23:** "Although many of the early attempts with telemedicine could not be sustained, there are some examples of highly successful programs that use very simple technologies. One such example is the radio medical network in Alaska. In remote villages in Alaska, health aides are trained to manage patient encounters by following strict guidelines established by the Indian Health Service, and they are authorized to administer care by the village doctors who are located in towns hundreds of miles away.

> At a given time of day, the health aides make radio calls to the village doctors and review patient encounters. The doctors then instruct the aides in certain treatments or other follow-up care. This system, although primitive, has improved the quality of care throughout Alaskan villages, illustrating how simple technologies can be useful in certain environments" (Mun and Turner, 1999: 591-592)

Unlike Exhibits 3.17-3.22, this Exhibit offers a description of the *organisation* of a telemedicine system which was used to provide health care in Alaska rather than the technology which facilitated that system's operation. In doing so, the account describes the personnel who operated the system, the manner in which they were taught to work, and how the system functioned. In contrast, the radio technology employed is barely explicated at all.

On the one hand, then, Exhibit 3.23 performs telemedicine as something much more complex than simply the use of telecommunications technology to provide health care services. Telemedicine in this account is about organisation, personnel, and training as much as it is about technology. On the other hand, however, the final sentence of this Exhibit returns to a performance of telemedicine as technology. The lesson the reader is asked to learn from the account is not that telemedicine systems require specially trained staff and careful organisation to function effectively, but instead that even "simple [telecommunications] technologies can be useful" for providing health care services "in certain environments". Thus, even as it describes a telemedicine system in terms of its organisation and structure, the account works to reduce telemedicine to an arrangement of technological artefacts.

Overwhelmingly, then, accounts of early telemedicine reduce the practice of telemedicine to the technological artefacts which enable it. This is done explicitly, via statements associating telemedicine with telecommunications technologies, but also implicitly through descriptions focused upon the technology of early telemedicine systems. There is, to be clear, nothing wrong with this. Telemedicine, by necessity, involves the use of telecommunications technology. Nevertheless, in reducing telemedicine to technology, these accounts erase other possible enactments of telemedicine, both in history *and in the present*.

Analyses of Early US Telemedicine

In addition to describing both the origins and form of early telemedicine, historical accounts also commonly present a brief analysis of the early telemedicine period. Broadly speaking, this manifests as a comment regarding the success or failure of early telemedicine systems but there is nevertheless a significant variation in the kinds of conclusions drawn.

A small number of accounts are more or less positive about early telemedicine. In Exhibit 3.24, for example, there is a slight allusion to difficulties with early telemedicine but the conclusion nevertheless praises early systems:

> **Exhibit 3.24:** "These [early telemedicine programs] were harbingers of what is now a huge element in patient management, but the import and the impact were no immediately translated into the mainstream of medicine. These programs use contemporary technology of audiovisual transmission and were actually excellent. However, the full power of telecommunications and informatics is now manifest" (Merrell, 2004: 4)

Merrell's account here works to perform telemedicine both in the past and present. Historically, according to his account, telemedicine was an effective tool in health care delivery, even if it failed to penetrate mainstream health care practice. Today, however, telemedicine has not only developed further as a health care technology, but it has become integrated into regular medical practice as a "huge element" in patient management.

Similar narratives of telemedicine and its history are presented by Breen and Matusitz (2010) and Strehle and Shabde (2006). In each of these accounts, telemedicine is described as having moved from strength to strength. Other accounts similarly laud the success of early telemedicine, but then also highlight difficulties with sustaining telemedicine projects due to their costs. For example:

> **Exhibit 3.25:** "In the years following up to the late 1980s, a rapidly growing number of telemedicine pilot projects were introduced to the medical community, most of them focusing on teleconsultation or tele-education for potential delivery to medical professionals in rural areas. However, since at that time the equipment necessary was equivalent to a television studio, tremendous expense in hardware and network communications never permitted the distribution of such services outside projects funded by public or industrial grants" (Ricke and Bartelink, 2000: 827)

In Ricke and Bartelink's account, telemedicine was a success but failed to diffuse into common practice as a result of its exorbitant costs. Without grants for research and

development, establishing telemedicine systems was not feasible. Implicitly, then, telemedicine practice was unable to expand until less costly technologies were available. House (1999) offers a slight variation on this version of telemedicine:

> **Exhibit 3.26:** "The MUN project used one-way television and two-way audio for distance education and medical data transmission, and linked the university to remove sites. Despite a very successful project, it was decided that television would be prohibitively expensive in an operational setting and the Telemedicine Group turned its attention to less expensive delivery systems" (House, 1999: 46)

The telemedicine project described in Exhibit 3.26 fits more or less with Ricke and Bartelink's more general overview in Exhibit 3.25: it is described as a successful project but encountering a problem of high costs. In Exhibit 3.26, however, this is said to have led to the use of alternative, less expensive technologies to keep the system running. In a similar vein, Mun and Turner (1999: 591-592) write that "[a]lthough many of the early attempts with telemedicine could not be sustained, there are some examples of highly successful programs using very simple technologies… [such as] the radio medical network in Alaska". In these accounts, then, it is not telemedicine in general which is performed as too costly but specific kinds of telemedicine, namely those based on television systems.

If there are various accounts which perform early telemedicine in a more or less positive manner, then there are others which are in contrast quite ambivalent. For example:

> **Exhibit 3.27:** "Despite the large number of projects, the hoped-for definitive conclusions were not obtained. Rather, answers were found to some questions, while more research was recommended to find answers to others. The feasibility of establishing the technological base of telemedicine was verified. It was demonstrated that telecommunications could be utilized as a substitute for travel to obtain medical care; to increase coordination and extend medical and administrative functions within a larger institution; and to establish a vital link in emergency situations where access to a physician was difficult or impossible to arrange" (Zundel, 1997: 73)

Unlike the other accounts examined so far, Zundel here describes early telemedicine as uncertain. While her description focuses on the things successfully demonstrated by early telemedicine studies, this is nevertheless counterpoised by her indication that many other questions were raised by these studies. In Zundel's account, then, early telemedicine remained unstable, never acquiring solid answers concerning its use and effectiveness. But the following account is more ambivalent still:

> **Exhibit 3.28:** "Evaluations of these early telemedicine projects suggested that the technology was reasonably effective in transmitting the information necessary for most clinical uses and that patients were generally satisfied with their treatments.
>
> "Unfortunately, the telecommunications infrastructure of the 1970s (and before) that was necessary to transmit video pictures, still images, and audio signals was scarce and prohibitively expensive. The newness of the technology for users and experimenters resulted in inefficiencies and was met with a general reluctance to adopt" (Mun and Turner, 1999: 591)

While Mun and Turner's account similarly asserts that early telemedince systems demonstrated the feasibility of telemedicine in practice, they also describe a host of problems. One of those is cost, but they also highlight difficulties using the technology which further inhibited the effectiveness of early telemedicine practice. As such, Mun and Turner perform early telemedicine as being sound in principle, but problematic in the context of the skills and resources available in the 1970s. This point is mobilised a little later to construct an explanation for telemedicine's resurgence in the 1990s:

> **Exhibit 3.29:** "The 1990s have witnessed a number of developments that support the resurgence of telemedicine applications. These include the national push for information superhighways, advances in high-speed computing and telecommunication, the introduction of video teleconferencing (VTC) systems, and growing interest in integrated healthcare systems" (Mun and Turner, 1999: 592)

Together, then, Exhibits 3.28 and 3.29 constitute a narrative attributing telemedicine's decline in the 1970s and subsequent re-emergence in the 1990s to technological innovation.

This narrative quite obviously performs telemedicine as a technology as discussed in the previous section. But in addition to this, Mun and Turner's account also provides an excuse for the failure of early telemedicine practice to take off. According to their narrative, early telemedicine was unsuccessful not because telemedicine is a flawed principle but because the vision of telemedicine exceeded the technological capabilities of the period. So, with the advent of more sophisticated technology, telemedicine practice has been liberated from these constraints, with the implication that there is no reason to expect telemedicine practice to fail in a similar manner in the future.

Other accounts of early telemedicine are less positive still. While cost remains an important theme, these accounts go on to highlight various other problems faced by early telemedicine systems. For example:

> **Exhibit 3.30:** "[P]oor contrast and spatial resolution and the need to send each image sequentially one at a time relegated the system [at Walter Reed General Hospital] to novelty status and it was never used seriously for patient care. High costs for dedicated installation, poor image resolution, and cumbersome logistics doomed the use of conventional television as an important medium for telemedicine. For the most part, television-based demonstration projects were terminated after these limitations were recognized" (Thrall, 2007: 613)

In contrast to Exhibits 3.24-3.29, Thrall's account in Exhibit 3.30 is fairly damning. Costly, cumbersome and ineffective, early telemedicine is described as being more or less valueless. Similar to Mun and Turner in Exhibits 3.28 and 3.29, however, Thrall goes on to contrast the weakness of early telemedicine with the strength of more recent telemedicine systems, thereby constructing contemporary telemedicine as having overcome the limitations of its earliest manifestations. While Thrall's account performs early telemedicine negatively, then, it uses this to produce a positive narrative of development similar to other accounts of telemedicine's history.

Nestor (2001) also constructs a negative account of early telemedicine:

> **Exhibit 3.31:** "The software was… proprietary and expensive. Linking and establishing locations at new sites were complicated and time-consuming. Communication among

> various hospital-based systems was almost non-existent. The entry and transmission of early telemedicine data were prone to error, distortion and general failures. These shortcomings inspired physicians to work more closely with technology experts to guide the efforts toward a more unified approach" (Nestor, 2001: 380)

In focusing on the problems of early telemedicine systems, Nestor's account here is not so different to Thrall's presented in Exhibit 3.30. However, Nestor deploys his description of early telemedicine's weaknesses differently, using them as an explanation for telemedicine's further development. While most accounts describe telemedicine researchers as simply appropriating telecommunications technology for use in medicine, Nestor here indicates a more collaborative relationship between physicians and engineers dedicated to solving problems specific to telemedicine practice. In describing how telemedicine has developed from its original forms, then, Nestor implies that it is not only the technology which has changed, but the kinds of persons involved in telemedicine development.

The various analyses of early telemedicine outlined here do not exhaust all the possible accounts that might be explicated. Lovette and Bashshur (1979) describe early telemedicine as having been promising – if also uncertain – and yet scuppered by inconsistent and myopic approaches to funding (Rosen and Simpson, 2001, offer a similar conclusion). Whitten and Collins (1997) make reference to organisational and management problems as well as problems of cost. Cipolat and Geiges (2003: 7) describe early telemedicine systems as lacking "a real consumer, user or outcome focus". And so on. Nevertheless, it should be apparent from the discussion above that analyses of early telemedicine systems are highly heterogeneous and that the different versions of telemedicine performed are often deployed in support of various narratives of telemedicine's subsequent development. It is these narratives of early telemedicine which constitute the focus of the final section of this Chapter.

Narratives of Telemedicine

As has been indicated throughout the Chapter – especially in the previous section concerned with analyses of early telemedicine – historical accounts of telemedicine work through and perform narratives. These narratives tell about the origins of telemedicine, how telemedicine has developed and what telemedicine has become. In this final section these narratives are examined in detail.

Narratives of Progress

> **Exhibit 3.32:** "It is interesting to note that essentially all of the [telemedicine] projects initiated prior to the late 1980s ultimately failed… First, all early projects were supported with large amounts of federal funding which was later withdrawn… Second, health care providers in the past were not well acquainted with computer and telecommunications technologies and seemed unaware of the potential benefits such systems might provide for their practices…
>
> But perhaps most importantly, early telemedicine components were unbelievably cumbersome and impractical for the majority of centres…
>
> Thus, telemedicine should not be considered a 'technology awaiting application.' Rather, the medical applications of telecommunication and computer technology have been exploited on a limited basis for many years. The difference in the 1990s is that the equipment has finally advanced to the point at which it is practical for a majority rather than a minority of medical providers, often without reliance on federal or other outside sources of funding" (Jerrant and Epperly, 1997)

The account presented in Exhibit 3.32 demonstrates a number of features outlined previously in the Chapter. It performs telemedicine as a set of technological apparatuses and presents a general summary of early telemedicine with an emphasis on its problems and failings. In doing so, it also performs a narrative of change: from its inception as crude, cumbersome, expensive and obscure, telemedicine has transformed into an affordable and practical array of technological devices. The time for telemedicine – so it is implied – is now.

This narrative is far from unique. Indeed, while it is articulated slightly differently each time, this narrative has already been encountered several times above in the exhibits of Nestor (2001; Exhibit 3.20), Kuo et al. (2001; Exhibits 3.21 and 3.22) and Mun and Turner (1999; Exhibits 3.28 and 3.29). In each of these instances, the technological shortcomings of early telemedicine are contrasted with new technological advances in the late 1980s and early 1990s to create a narrative account of progress. And, in doing so, the failings of early telemedicine are distanced from contemporary telemedicine practice.

While accounts of early telemedicine frequently perform this narrative in more or less the same manner as the examples already given, some work to formalise or even theorise that narrative:

> **Exhibit 3.33:** "All the definitions during the *first era* of telemedicine focused [on] medical care as the only function of telemedicine… The application in this era was dependent on broadcast television technologies where telemedicine application was not integrated with any other clinical data.
>
> "The *second era* of telemedicine, dedicated era, started during the late 1980s as a result of digitalization in telecommunications and it grew during the 1990s…
>
> "Dedicated era has turned into an Internet era where more complex and ubiquitous networks are supporting the telemedicine [sic.]. The *third era* of telemedicine is supported by the technology [sic.] that is cheaper and accessible to an increasing user population" (Tulu and Chatterjee, 2005: 2; original emphasis)

In a basic sense, the narrative performed here in Exhibit 3.33 is similar to the narrative presented in Exhibit 3.32 above as they both perform telemedicine through a narrative of progress and development. In this instance, however, the narrative has been formalised into three distinct eras which are defined by the kinds of technological applications being used. The first era is defined by the use of television; the second by the use of purpose-built telecommunications technologies to produce and transmit data directly; and the third by generic, web-based systems. The consequence of this narrative is that telemedicine is reduced further: not only is telemedicine reduced to technology, but it is reduced to particular kinds of technology which are taken as defining entire periods of telemedicine activity.

> **Exhibit 3.34:** "[W]e describe the telemedicine innovation process through three categories which comprise the basis of a communication-based understanding of diffusion. First, an innovation is literally invented… Second, the very life of the innovation is charted through the continuously changing meaning, or how people understand and apply the innovation in the reinvention stage. Finally, as the innovation constantly changes shape and meaning, the context of the very invention itself becomes more and more decentralised through the evolving applications and understandings that adopters and inventors have of the innovation" (Whitten and Collins, 1997: 24)

In contrast to the other accounts that have been presented so far, Whitten and Collins in Exhibit 3.34 offer a formal theorisation of telemedicine's development. Grounded in Roger's (1995) work on the diffusion of innovations, they argue that telemedicine has developed through three phases: invention, reinvention and decentralisation. In their account, early telemedicine constitutes the 'invention' stage, its re-emergence in the 1990s the reinvention stage and, finally, its transition into general use as the decentralization stage.

The exposition of early telemedicine which is presented elsewhere in the text, however, is not at all dissimilar to other accounts of early telemedicine outlined above. While it is more thorough and detailed than most, it nevertheless describes early telemedicine projects through individual cases and provides a summation in its conclusion indicating various problems with early telemedicine as a whole. Furthermore, in spite of describing the process of invention and reinvention as related, in practice their account only focuses on the failure of early telemedicine and its subsequent re-emergence. Hence, while Whitten and Collins offer one of the more detailed examinations of early telemedicine, most of that detail is rendered irrelevant since it is the decline of early telemedicine that is centred by their conceptual narrative.

Another way in which early telemedicine has been rendered into a narrative is through the notion of technological determinism (i.e. a position which understands technology as self-determining and the principle force of human society; see for example Matthews, 2006). In many accounts, this is done implicitly through rendering the development of telemedicine in terms of broader innovations in telecommunications technologies (as has been outlined above). However, there are some instances where it is evoked more explicitly. For example:

> **Exhibit 3.35:** "As time passed, and as medicine rapidly developed into a far more sophisticated sphere, especially at the technological level, telemedicine generated greater importance and visibility by the 1980s. This is a time when costs decreased for much of the information and communication technologies on which it relied" (Breen and Matusitz, 2010: 3)
>
> "Clearly, *it makes logical sense* that telemedicine has advanced, developed, and thus gained increased acceptance from several communities where it can be tapped into and applied" (Breen and Matusitz, 2010: 5; emphasis added)

The two quotes in Exhibit 3.35 perform a narrative of technological determinism. In the first quotation, like many other accounts, telemedicine development is tied to technological innovation. In the second quotation, however, that innovation is explicitly normalised through the assertion that it "makes logical sense". That telemedicine has developed and become more sophisticated, then, is rendered a part of a natural and inherent process.

The deployment of technological determinism, however, is most clearly and powerfully used by Bashshur and Shannon (2009):

> **Exhibit 3.36:** "[T]echnological innovations are *cumulative and unidirectional*. Each generation builds on the work done by the previous one, thereby accelerating the process of development. Innovations are subject to an evolutionary process that sifts and sorts them thereby transmitting some and discarding others" (Bashshur and Shannon, 2009: 70; emphasis added)

The quotation in Exhibit 3.36 unequivocally asserts that technological change is both progressive and linear and it is therefore a clear indication of technological determinism. This conviction is demonstrated elsewhere as well, for example, in the assertion that technology has a "life of its own" (Bashshur and Shannon, 2009: 70) and is therefore beyond influence. Technology is also asserted as the determining force in modern societies:

> **Exhibit 3.37:** "[T]he use of this technology [i.e. telecommunications technology] now drives nearly all segments of modern society, including industry, commerce, education, entertainment, and of course healthcare" (Bashshur and Shannon, 2009: 70)

In the context of Bashshur and Shannon's text as a whole, this narrative of technological determinism is powerfully reductive. Since telemedicine is described as having developing autonomously in accordance with its own logic, the transformation and development of telemedicine is rendered an insignificant matter of concern. On the one hand, then, Bashshur and Shannon present in their text a detailed examination of almost all of the telemedicine projects undertaken in the US during the 'early' period. On the other hand, however, these examinations focus their attention on the technology of telemedicine, its functions and the published research material generated by early telemedicine trials. As

Reflexions: *On the Use of Exhibits*

One of the difficulties I have found working through exhibits is that sometimes there is no single scrap which adequately does the work that is required of it. Take the discussion of Bashshur and Shannon's narrative of technological determinism here as an example. While there are some clear examples of technological determinism in their text – and these have been exhibited – the theme of technological determinism is something which is tacitly present throughout the text as a whole. Yet, there is no way in which this can be conveyed through one or even a multitude of exhibits. It would be necessary to work through and discuss the entire text to demonstrate that point.

Similarly, in order to describe Bashshur and Shannon's actual account of early telemedicine, it has been necessary for me to resort to a general summary as, again, there is no way in which this could be conveyed through one or even several exhibits. In this instance, as with my use of generalising statements, I have slipped away slightly from writing a pinboard account. For in my examination of Bashshur and Shannon's text, I do not centre my discussion on the exhibits I have presented.

As previously, I shall not correct this. But this is not only to highlight the issue as a possible pitfall but to suggest that this may be a limitation of the pinboard method. If the use of exhibits is a central way of producing a pinboard account, what becomes of those things that cannot be performed through them? This is one way in which the pinboard might perform erasures of its own.

detailed as it is, then, their account is nevertheless in the same vein as most other accounts of early telemedicine: a list of independent telemedicine projects which are explicated primarily as technological systems. Hence, in spite of possessing the data and resources to produce a detailed account of telemedicine's development, Bashshur and Shannon produce a fairly mundane account instead as a result of explaining away change through a narrative of technological determinism.

Narratives and the Politics of Ontology

Throughout this Chapter, it has been asserted frequently that accounts of early telemedicine *enact* or *perform* some version or another of telemedicine. In writing about origins, for

example, telemedicine was said to be performed by some accounts simply as 'medicine at a distance' while, in others, as specially designed healthcare systems using specific kinds of technology. The argument being made in these instances is that accounts of early telemedicine are engaged in a kind of ontological politics (Mol, 1999; see Chapter 1). That is to say that by describing and articulating telemedicine in a particular way, they make certain versions of telemedicine more or less real in accordance with that rendering (on this, also see Latour, 1987). If telemedicine is articulated as 'medicine at a distance' then this makes that version of telemedicine a little more durable, while if it is performed as a specially designed health care system using only audio-visual technologies then broader conceptualisations of telemedicine become a little less.

These examples of ontological politics, though, have primarily related to specific descriptions or articulations of telemedicine rather than the narratives in which those descriptions are embedded. But there are also a number of examples of narratives in early telemedicine literature which, in their entirety, work to perform telemedicine in a particular manner.

> **Exhibit 3.38:** "The *televisit* provides service to patients who are remote from a professional healthcare provider. For the most part, the goal is service delivery where it might not otherwise be available…
>
> "*Telemonitoring* provides physiologic data to a remote clinician for the purposes of early detection of disease exacerbation… expense avoidance… [and] more intelligent scheduling of expensive home visits" (Braunstein, 2007: 3; emphasis added)
>
> "*[T]elemanagement*… is directed at the long-term management of patients in their home through highly individualised 'case management strategy'" (Braunstein, 2007: 5; emphasis added)

The collection of quotes presented in Exhibit 3.38 offers an overview of Braunstein's (2007) account of telemedicine and its development. Here, as in other examples presented above, telemedicine is described as having moved through three stages. Unlike other accounts of telemedicine, however, these stages are defined not by the technology in use but the purpose of that technology. Hence, the first "wave" of telemedicine was defined by the 'televisit' – a consultation between patient and physician. The second "wave" of telemedicine was defined instead by 'telemonitoring' – the remote measurement of physiologic data to detect health problems before they become serious. And the third,

'telemanagement', is an integrated system of health monitoring and care conducted remotely through telecommunications systems.

What is interesting about this example is that the third wave – telemanagement – is not a historical but a *future* wave of telemedicine:

> **Exhibit 3.39:** "What might be next [after telemonitoring]? In looking towards its future, Norwegian telemedicine expert, Birger Nymo, defines telemedicine as 'the investigation, monitoring and management of patients and the education of patients and staff using systems which allow ready access to expert advice and patient information no matter where the patient or relevant information is located'.
>
> "This definition anticipated several aspects of telecare which we have come to feel essential if the goal is to be expanded to improve clinical outcomes for patients – a concept we call 'tele*management*'" (Braunstein, 2007: 4; original emphasis)

The narrative account of telemedicine's development presented by Braunstein, then, is a teleological narrative with telemanagement as its end goal. If early telemedicine is rendered in terms of what Braunstein refers to as the 'televisit' then this is in service of a narrative which demonstrates the expanding function of telecommunications in medicine over time. While once telemedicine merely replicated existing medical services (the 'televisit'), it has expanded to also work as a preventative measure ('telemonitoring') and in the future will be a means of caring for patients too ('telemanagement'). Given that Braunstein is CEO of a business which produces and operates telemanagement systems, this is a fairly brazen example of ontological politics in action!

> **Exhibit 3.40:** "The development of telemedicine in the United States can be divided into three stages: 1964-1969, 1969-1973, and 1973-present.
>
> "*The first stage* involved experimentation by medical practitioners on the clinical applications of telecommunications technology. The primary concern was the feasibility of two-way transmission of diagnostic information and clinical encounters via microwave links and video equipment...
>
> "*The second telemedicine stage* was characterized by a trend towards the exchange of knowledge and expertise among the participants, and by Government support and

> sponsorship of research and demonstration programs… During this stage, issues other than technical ones received some attention. These included consideration of the appropriate organizational and environmental settings for telemedicine implementation […] rudimentary approaches to evaluation of telemedicine's impact on health-care delivery [and so on]. The contributions of telemedicine to society as a whole were variously presented, but although some evaluation projects were started during the period, there were no significant efforts to investigate or document those benefits…
>
> "*The third, and present, stage* started in 1973, and its characteristic feature is the idea of telemedicine as an innovative mode of medical-care delivery. Two factors must be dealt with during this stage: sooner or later, telemedicine has to become self-supporting, or at least economically viable on its own; and the evaluation of telemedicine has to follow the concepts and methods of evaluation in the medical-care field" (Bashshur, 1976: 33; original emphasis)

Exhibit 3.40 is derived from Bashshur (1976) and it outlines the development of early telemedicine across three stages describing the kind of research being undertaken at the time. During the first stage, telemedicine research was concerned with demonstrating *feasibility*; during the second attention shifted to the *organisation and implementation* of telemedicine; and during the third attention shifted to issues of *evaluation and economics*. At each stage in the narrative, telemedicine is implicitly rendered a little more durable. At the end of the first stage, telemedicine's feasibility was demonstrated and telemedicine therefore rendered a plausible means of health care delivery. After the second stage, effective methods of organising and structuring telemedicine had been produced such that telemedicine was in a position to be implemented more generally. Hence, in the final stage it was only the issues of funding and evaluation to be resolved.

This narrative, then, performs telemedicine on the cusp of becoming standard medical practice. In context, this ties to the theme of the paper in which it appears, entitled: "Coming: the Era of Telemedicine" (Allan, 1976). It also, as will be demonstrated in Chapter 6, ties into Bashshur's own agenda regarding telemedicine, since this paper is published around the time that Bashshur became aware that telemedicine research was being wound down (NLM 2009-060: 1). Hence, again, the narrative that is presented in Exhibit 3.40 is engaged in an overt act of ontological politics through its attempts to keep telemedicine research open.

Exhibit 3.41: "The early stage of the development of telemedicine was characterized by the pioneering effort of a few individuals drawing upon personal and organizational resources and with little public or private financial support for their efforts. The second stage, between 1965 and 1973, consisted of a deliberate effort towards research and development of the potential of telemedicine and was spurred by the infusion of short-term federal support. Due to the substantial capital investment required and high maintenance costs involved, it was not possible to realize organized, comprehensive telemedicine projects except as federally supported demonstrations…

"The third stage of telemedicine began around 1973, with active involvement in evaluation by interdisciplinary teams. For the first time, social scientists and specialists in medical care organization, planning, and delivery were included in the effort. The first of a planned series of national conferences brought together researchers, users, designers, and industry representatives to share experiences, plans, and findings" (Lovett and Bashshur, 1979: 7)

As in Exhibit 3.40, the narrative presented in Exhibit 3.41 divides the development of early telemedicine into three stages, although the stages here are defined quite differently. Rather than differentiating the stages by recourse to the kinds of research being undertaken in each, the stages are instead defined by the state of telemedicine research at the time. Hence, the first stage is characterised by pioneers engaged in the first few trials of telemedicine research, while the second is characterised by government investment and the establishment of several experimental projects. In the third stage, telemedicine research is described as having become more sophisticated: with research groups, conferences, and the involvement of professional social and organisational scientists in the evaluation of projects.

While Exhibit 3.41 defines its stages differently to those in Exhibit 3.40, the overall effect of the narrative is the same. At each stage, telemedicine research is described as having become more sophisticated. Hence, with the emergence of the third stage, it is finally possible to test and evaluate telemedicine effectively. In context, again, this narrative works in support of the main thrust of the article in which it is presented:

Exhibit 3.42: "Besides clear and consistent policy objectives for evaluation, there is a need for consistent policy concerning the support for projects. Criticism has been

> levelled at federal policy with respect to the extent to which it would initiate and support telemedicine demonstration/evaluation projects. Among the more sensitive there is a perception that interest and support of telemedicine flagged very quickly and was capricious in its frequency and level of funding. To some extent, findings from limited demonstrations, programs cut short, and inadequate data were used to determine policy with regards to future support.
>
> "Fundamental to the failure to achieve complete evaluation of telemedicine was the frequent failure on the part of policy makers supporting research, of funders of projects, of providers, and of researchers to place telemedicine in the total context of health care delivery" (Lovette and Bashshur, 1979: 13)

In Exhibit 3.42, Lovette and Bashshur rail against what they consider to have been an ineffective and ill-thought-through approach to telemedicine research adopted by federal funding bodies. His point, when conjoined with his narrative of telemedicine's history and development, is that funding for telemedicine research was withdrawn at just the moment that it was best set to undertake such research. Hence, again, the narrative that is deployed in the text is engaged quite explicitly in an act of ontological politics through its enactment of telemedicine research as only now ready to produce the knowledge required for a robust and accurate evaluation of telemedicine.

Conclusion

This Chapter has covered a lot of ground. It has presented an outline of existing accounts of early telemedicine, demonstrating the structure and form of these histories as well as their contents. It has also outlined the way in which these histories construct narratives of early telemedicine and demonstrates a little of the politics that these narratives perform. While the analysis presented in this Chapter will be referred back to later for the purposes of comparison, the following is a summary of the key points made throughout.

Firstly, it was demonstrated that accounts of early telemedicine work through a combination of case-based descriptions and general summaries. While some accounts deploy only one of these two approaches, many combine them, moving from one to the other. The key point here is the reduction performed by these two approaches. Working through cases, accounts of early telemedicine implicitly erase those other telemedicine projects that they do not describe and, on aggregate, the early telemedicine period has been more or less reduced to three main projects as a result of their prevalence in the literature. Likewise, in working

through summations the differences and complexities of early telemedicine are erased to produce a single and homogenous 'Telemedicine'.

Secondly, telemedicine is enacted more or less ubiquitously as a technological apparatus. This said, discussions of telemedicine's origins and the outcomes of early telemedicine experimentation are highly varied in the telemedicines they perform. Hence, while individual texts tend to reduce telemedicine to a single form, on aggregate early telemedicine is performed as heterogeneous and complex through accounts of it.

Finally, narratives of progress are very common in accounts of early telemedicine. Usually, these tie the early telemedicine period to later developments so as to indicate the advances that have been made in telemedicine practice and to demonstrate how problems have been overcome. Nevertheless, there are a variety of ways in which these narratives are performed. In some instances, they are fairly implicit, while in other cases progress is explicitly outlined through formal theorisation. In any case, these narratives are all engaged in a kind of ontological politics, defining and redefining what constitutes telemedicine sometimes in a direct and intended manner.

Chapter 4

The Pinboard in Practice I:
An Account of Early US Telemedicine, 1950-1980

This Chapter is the first of three case studies exploring the pinboard method via the empirical case of early US telemedicine. The purpose of this first case study is simply to offer an illustration of the pinboard in practice. To do this, the pinboard method is used to produce an overview of US telemedicine between 1950 and 1980. But in addition to this, the Chapter also offers an evaluation of the pinboard method through a comparison between the account produced here and accounts of early US telemedicine that were outlined previously in Chapter 3.

Accordingly, the Chapter is divided into five sections. In the first, a 'typical' version of US telemedicine is outlined, drawing upon Bashshur's (1975) rendering of telemedicine in an important contemporary telemedicine publication. This first section is then used as a point of contrast for the following three sections, which are concerned with detailing in turn the technology, applications and structure of early US telemedicine systems. Then, in the final section, a critical discussion of the Chapter and the pinboard method is presented. There, it is argued that while the approach taken in this Chapter produces an account with quite different focuses and highlights compared with those outlined in Chapter 3, it nevertheless covers the same ground and is not radically different other than in its depth.

Telemedicine, 1973: A Snapshot

Telemedicine: Explorations in the Use of Telecommunications in Health Care (Bashshur et al., 1975) is an edited collection of papers presented at the first US national telemedicine conference held in Ann Arbour, Michigan, 1973. Its chapters offer a description of the various telemedicine systems that were initiated in the early 1970s – primarily by the National Science Foundation (NSF) and Health Care Technology Division (HCTD) of the Department of Health, Education and Welfare (HEW) – alongside discussions of telemedicine research and practice. The first substantive chapter following the introduction is a paper

written by Rashid Bashshur (1975), who had organised the Ann Arbour conference and who was becoming one of telemedicine's most prominent scholars. His chapter, rather than focusing on a specific telemedicine project, presents instead a more general conceptual overview of telemedicine practice. It is half description and half vision, describing existing telemedicine practice but also describing what telemedicine practice should become. Accordingly, Bashshur's paper is a snapshot of telemedicine – one prominent version of telemedicine – at its peak, prior to the moratorium on telemedicine research which would occur a few years later. To begin, then, here is a rendering of Bashshur's version of telemedicine.

> **Exhibit 4.1:** "The application of telecommunications technology in the practice of medicine – generally referred to as telemedicine – has been proposed as a solution to some currently pressing problems as well as a long-term tool for the improvement of health services. While the concept of telemedicine primarily emphasizes the use of telecommunications, it has other important parameters that also make it an innovative health care delivery system" (Bashshur, 1975: 15)

Exhibit 4.1 is taken from the introduction to Bashshur's chapter. It firstly outlines telemedicine quite simply as the "application of telecommunications technology" in medicine. However, as is hinted by the final sentence of the Exhibit, the telemedicine that Bashshur is to perform is more complex than this simple definition would suggest.

> **Exhibit 4.2:** "Though not a panacea… [telemedicine] can provide a partial solution to problems in the distribution of medical manpower in the country as a whole, within specific regions, or even in small communities; it can be used as an integrative mechanism to the proliferation of medical specialization and fragmentation of medical responsibility; it can provide a meaningful clinical role for the health professional who does not have an M.D. degree, without a diminution in the quality of care for the patient; it can decrease some of the barriers to the receipt of care for those who are at a locational disadvantage in relation to health facilities; and it can also serve as a mechanism for collegial interaction among health professionals, and serve as an instrument for quality control in administrating health services" (Bashshur, 1975: 15-16)

Here in Exhibit 4.2 Bashshur outlines (many) potential benefits of telemedicine. It is both modest and bold. On the one hand, Bashshur lists a number of important problems in contemporary medicine which the practice of telemedicine is said to address. On the other hand, however, this is qualified through the assertion that telemedicine can only serve as a *partial* solution to these problems, thereby cautioning against overenthusiastic expectations.

In terms of the issues listed, most are related to the distribution of healthcare resources. The first point concerning the distribution of medical manpower refers to the tendency of health care professionals (and particularly specialists) to cluster in urban rather than rural spaces (Shannon, 1975; Bashshur and Shannon, 2009). The further point concerning "locational disadvantage" refers to similar problems created by the distribution of health care facilities in urban spaces where superior facilities tend to be located in wealthier areas which are not as easily accessed by poorer populations (Shannon, 1975). One alternative solution to these problems of access was to make greater use of non-MD health professionals to support physicians and, in cases of simple or mundane tasks, outright replace them (Fink and Zerof, 1971; Lieberman, 1967). As implied in Exhibit 4.2, however, this was accompanied by concerns about reducing standards of care (more on this below, but see for example: Bird, 1975; NLM 2009-060: 2). Therefore, Bashshur's point regarding non-MD professionals made in Exhibit 4.2 is also related to the issue of healthcare resource distribution.

This set of issues has served as a key justification for telemedicine historically and continues to be a justification for telemedicine in the present (present day examples include: Bashshur, 1997; Bashshur and Shannon, 2009; Brecht and Barret, 1998; Purcel, 1998):

> **Exhibit 4.3:** "Two-way television group therapy may be the means for skilled mental health professionals to extend their services to persons in distant areas which have insufficient numbers of therapists" (Wittson et al., 1961: 22)

> **Exhibit 4.4:** "Under utilisation [sic.] of the full potential of each of our health care professionals may be the major factor in their decreasing availability for individual health services.
>
> "Although there is no substitute for the physician or for the nurse or for any of the other health professionals who maintain the pastoral and scientific quality of health care, the fact is that these specialists are in growing short supply.

> "Teleconsultation: A New Health Information Exchange System is intended to increase the availability of these great professional resources to our nationwide hospital and patient care systems by the appropriate use of technology, task allocation and telecommunications" (Bird et al., 1971: 1)

In both of these two Exhibits, telemedicine practice is justified in more or less the same terms as in Exhibit 4.2. The first, Exhibit 4.3, indicates the use of interactive television to provide mental health care services to those who might not otherwise have access to such services. The second, Exhibit 4.4, is slightly different in that it focuses on the supply and absolute number of healthcare practitioners rather than their distribution per se. Nevertheless, the issues of supply and distribution were often rendered together in discussion, on the grounds that a low supply of medical practitioners exacerbates unequal distribution (e.g. Bird, 1975).

But while the first set of issues outlined in Exhibit 4.2 were well-established justifications for telemedicine, the remaining two points that Bashshur raises were less common. The first, fragmentation of care, refers to breakdowns in continuity of care arising from the increased specialisation of medicine in the post-War period (Lieberman, 1967). The second, collegial interaction, is in fact not so much a problem as an opportunity for engendering collaboration between physicians and producing, generally, a more integrated health care system. Both of these points, then, are not concerned with the direct provision of health services but instead with the way in which healthcare services are *organised* (especially with regards to their level of integration and interconnectedness). In the words of Allan Shinn, program officer at the National Science Foundation, telemedicine might serve as a "sort of 'social cement' to hold an organisation together" (Shinn, 1975: 14).

> **Exhibit 4.5:** "The typical program in telemedicine consists of a two-way communications link between a central facility staffed by a physician or group of physicians and several satellite stations staffed by nurse practitioners or physician assistants. This arrangement provides an opportunity for patients to be seen usually by a nurse practitioner in the satellite station, while both patient and nurse have full access to a primary care physician or other specialist at the central facility… Typically, the nurse practitioner works under the direct supervision of a physician who is physically located elsewhere. If he/she cannot handle the specific problem at hand, then he/she is instructed on the proper course of action" (Bashshur, 1975: 19)

Moving now to consider the form of early telemedicine, Bashshur provides in Exhibit 4.5 an outline of a 'typical' telemedicine system. There are two key points. Firstly, the 'typical' system is described as a kind of 'hub-and-spoke' design whereby a central medical centre provides resources – technology and expertise – to one or several remote 'satellite' clinics via a telecommunications link. In this way, the satellite clinics are able to draw upon resources at the central hub which ordinarily would be unavailable due to their cost or scarceness. Secondly, the design is hierarchical, placing the staff at the satellite clinics directly under the supervision of physicians at the central hub. Indeed, the nurse clinician is implicitly rendered an extension of the physician, carrying out instructions at their behest.

Though it is unwritten in Bashshur's paper, this hierarchical organisation of telemedicine works to produce healthcare practices which mimic, as closely as possible, their equivalent in-person practices. Ensuring this was the case was a major concern of LAMS director Kenneth Bird, who at the Ann Arbour telemedicine conference cautioned that:

> **Exhibit 4.6:** "The use of new allied health service personnel in various physician extender roles must be carefully monitored by the physician. Significant reduction in quality of service may occur unless the physician continues as the responsible provider" (Bird, 1975: 94)

The explicit use of the term "physician extender" in Exhibit 4.6 clearly demonstrates the role that was envisaged for non-MD healthcare professionals working with telemedicine systems. It is the physician who is centred, while the non-MD providers labour for them in a variety of capacities to make up for the lack of physical proximity between the physician and patient. In this sense, non-MD providers are rendered a part of the instrumentation of telemedicine, that is, they serve as a part of the apparatus that is used by the physician as they practice medicine-at-a-distance. See here:

> **Exhibit 4.7:** "Like the physician clinician, the nurse clinician elicits a patient history and defines the patient's problem. The nurse clinician then carries out an appropriate physical examination; both tasks are done independently of the physician. Next, she notifies the physician that a patient is to be seen using the interactive television… link. She reviews findings with the physician with or without the patient present, depending on the circumstances. The physician can then see and 'examine' the patient. If

requested, the nurse can provide visual reinforcement to the clinician, describe the already determined auscutatory findings, and place the stethoscope where the physician requests" (Bird, 1975: 93-94)

The description presented in Exhibit 4.7 indicates that the nurse clinicians working at LAMS serve as "physician extenders" in two ways. Firstly, and more obviously, the nurse clinician extends the capability of the physician by undertaking tasks that the physician cannot as a result of their physical distance. In this way, the nurse clinician acts as the physician's eyes and hands by describing colour (the television system was black-and-white only), manipulating a stethoscope, and so on. Secondly, however, the nurse clinician also extends the physician temporally by undertaking mundane tasks such as eliciting a patient history. In principle, the physician could do this via the television system but, by undertaking this task instead, the nurse clinician allows the physician to focus their time on tasks requiring greater expertise. Hence, the nurse clinician 'extends' the physician by substituting them in both space and time.

The significance of replicating existing face-to-face practice is also apparent in terms of the initial feasibility experiments undertaken by Bird and others working with the MGH-LAMS system. With the exception of Dwyer's (1973) paper, which offers instead a broad overview of telemedicine in psychiatry, the various research papers published in relation to the MGH-LAMS system are all aimed at demonstrating the closeness between telemedicine and mundane healthcare practices (see Andrus and Bird, 1972a, 1972b; Andrus et al., 1975a, 1975b; Bird, 1972; Murphy and Bird, 1974; Murphy et al., 1970, 1972, 1973). For example:

Exhibit 4.8: "Table 1 compares diagnoses made by television to those made directly. The 'actual' diagnosis was that of the dermatologist who had examined the patient and obtained the photograph. Observer 2, a professor of dermatology, interpreted 67 of the 75 slides as correctly by telediagnosis as he did on direct viewing of the color slide. The comparable figure for observer 1, a dermatologist on the hospital staff, was 85.3%. Television diagnosis was less accurate than direct viewing of projected slides in five cases for observer 1 and one case for observer 2. A surprising finding was that each observer was more accurate by television than the direct viewing of projected slides in two cases" (Murphy et al., 1972)

The text presented in Exhibit 4.8 is an exemplar of the kinds of experiment undertaken by staff at MGH using the telemedicine system. In this example, the ability to diagnose dermatological illnesses was tested through comparing the number of accurate diagnoses of illnesses via both television and via a slide. Similar experiments were done examining diagnoses related to auscultation (Murphy et al., 1973) and radiography (Murphy et al., 1970; Andrus and Bird, 1972; Andrus et al., 1975a, 1975b). These experiments, however, were concerned with demonstrating not only outcomes comparable to in-person care but also with the actual processes involved in arriving at those outcomes:

> **Exhibit 4.9:** "The objection has been made that the use of a field of view less than the size of the roentgenogram makes it necessary to scan consecutively or in some reasonable pattern in order to eventually examine the entire image. Actually, it is also necessary to scan when reviewing a film directly in the conventional manner [i.e. in person]" (Andrus and Bird, 1972: 656)

In Exhibit 4.9, Andrus and Bird are responding to critics who argue that the practice of reading a roentgenogram (i.e. an x-ray photograph) through a camera is problematic because it is not possible to view to entire image as a whole. Implicitly, then, the argument is that telemedicine does not recreate the normal circumstances of radiography and is therefore unacceptable. Andrus and Bird's claim, however, is that the radiologist in fact must scan the image even when they view it directly. To support this argument, they enter into a detailed technical discussion of vision. See here:

> **Exhibit 4.10:** "Foveal vision in a single fixation between saccades… includes an area subtending only 2° at the eye. An angle of 9° has been suggested as optimum size for a fixed display. In order to include the entire 432 mm vertical extent of a 14'' by 17'' maximum format roentgenogram within 9°, the reading distance would have to be… over 109 inches. As a consequence, the finest details in the roentgenogram cannot be discerned. The usual reading distance is about one-fifth of this distance. Thus, standard practice in direct visualisation of a roentgenogram is to adjust oneself for a close-up with a foveal field of view less than the size of the film. The result is magnification… which corresponds to the television tube target" (Andrus and Bird, 1972: 656)
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The detailed argument that is presented in Exhibit 4.10 contends that the manner in which the camera is used in teleradiology is more or less literally equivalent to the functioning of the human eye when reading a roentgenogram directly. Reading a roentgenogram, it is argued, requires scanning with the eye since it is impossible to view the entire image at the same time in sufficient detail. As such, the necessity of scanning the roentgenogram with a camera during teleradiology is no different to standard practice. Hence, teleradiology is rendered equivalent to in-person radiography not only in terms of the outcomes (i.e. successful diagnoses) but also the biology of looking (i.e. the movement of the eye).

To conclude, then, Bashsur's account of telemedicine renders it in three different ways. Firstly, it renders telemedicine as a technological apparatus. Secondly, it renders telemedicine as a healthcare service which both improves and equalises access to healthcare resources. And thirdly, it renders telemedicine as a hierarchical and centralised form of healthcare system. These three themes – technology, health services and healthcare systems – are used to organise the remainder of this Chapter. In each of the following three sections, various corresponding enactments of telemedicine are outlined and juxtaposed both with one another and with Bashshur's 'typical' version of telemedicine that has been outlined here.

Telemedicine as a Technology

In Bashshur's overview of telemedicine outlined above, the question of technology is left open. Telemedicine, he asserts, is underpinned by telecommunications technology but any such technology might be used in practice. In spite of this, however, where Bashshur dedicates explicit attention to the technology of telemedicine later in his account, the focus of his discussion is specifically on the subject of interactive television:

> **Exhibit 4.11:** "[T]he use of interactive television in direct patient care has important ramifications for the process of communication and information transfer… On the one hand, a certain amount of information could be missed because the patient is not physically present during the clinical encounter… On the other hand, the medium of interactive television could be manipulated to enhance the quality and quantity of communication and information exchange. For example, images can be moved closer, away, to one side of the other [etc.]" (Bashshur, 1975: 26)

There is no equivalent discussion of other telecommunications technologies in Bashshur's text. The consequence of this is that while the concept of telemedicine is divorced from any specific kind of telecommunications technology, in the context of actual discussion it is interactive television that is centred. The issue of telemedicine, therefore, is held in tension by Bashshur's text.

Elsewhere, however, this centring of interactive television is more explicit. For example:

> **Exhibit 4.12:** "Telemedicine can be defined as the practice of medicine without the usual patient-physician confrontation or it is the practice of medicine via interactive television" (Bird, 1971: 3)

The definition of telemedicine given in Exhibit 4.12 performs, more or less, the same telemedicine as does Bashshur. While it allows for the use of any kind of telecommunications technology as a basis for telemedicine, it also works to centre interactive television. That said, both accounts centre interactive television in different ways. To borrow from Law (2004: 84-85), in Bashshur's (Exhibit 4.11) account telecommunications technologies are rendered "manifestly absent", that is, they are rendered absent from the discussion without explicitly being erased as irrelevant. In contrast, in Bird's account (Exhibit 4.12) alternative technologies are excluded almost by definition, that is, they are rendered (almost) as irrelevant and therefore "Other" (Law, 2004: 85). This centring of interactive television as a basis for telemedicine is completed in full in Ben Park's writing:

> **Exhibit 4.13:** "Telemedicine is defined in this report as the use of two-way interactive television to conduct transactions in the field of health care" (Park, 1974: 1)

The short quote in Exhibit 4.13 is taken from the beginning of Park's *An Introduction to Telemedicine,* the first full-length book to be published on the subject. Here, telemedicine is defined quite clearly in terms of interactive television and other telecommunications technologies are therefore erased. This is not, to be clear, simply a matter Park wanting to maintain a tight focus. See here:

> **Exhibit 4.14:** "My investigation of interactive television began in January, 1972 but was sporadic until April, 1973 when grants from the Rockefeller Foundation enabled me to give telemedicine my full attention for the year" (Park, 1974: ii)

Exhibit 4.14, taken from the preface of Park's (1974) book, shows a clear elision of telemedicine and interactive television, both of which are used interchangeably. Examples of this elision can be found in his other publications as well. For example, his contribution to the Ann Arbour telemedicine conference in 1973 entitled "Communication Aspects of Telemedicine" (Park, 1975) offers a detailed discussion of interpersonal interaction via two-way television. While he discusses telephonic communication briefly in the introduction to his paper, this is done in juxtaposition to communication via interactive television and it is dropped from the discussion entirely after this brief contrast. In Park's accounts of telemedicine, then, alternatives to interactive television are erased – made Other – and interactive television itself centred.

In contrast to all this, some accounts of telemedicine rendered it technologically non-specific:

> **Exhibit 4.15:** "The choice of consultation medium should be influenced strongly by the skill levels of the paramedics and the relationships established between the paramedics and physician consultants.
>
> "The options range from telephone to television supplemented by biomedical telemetry. An intermediate option is telephone facsimile… As a rough rule of thumb for estimating the relative costs of the various options, the facsimile techniques cost about ten times as much as the telephone and the two-way TV costs about ten times as much as facsimile" (NLM 2009-060: 2)

The discussion presented in Exhibit 4.15, which pertains to a telemedicine system operated at a care home in Boston, is very much at odds with Park's definition exhibited above (Exhibit 4.13) and also – though only somewhat – with the accounts of Bird (Exhibit 4.12) and Bashshur (Exhibit 4.11). Here, the use of television is completely decentred, being listed as only one of a variety of options. Exhibit 4.15, then, performs the issue of telemedicine technology as a choice in which cost and practitioner skill are the two key variables to be

considered. By implication, this conceptualisation also runs against the notion that telemedicine can (and must) replicate as closely as possible the circumstances of traditional face-to-face medicine (outlined in Exhibits 4.6-4.10 above), since neither the telephone nor facsimile model regular communication as exactly as with television. Hence, the enactment of telemedicine in Exhibit 4.15 is significantly more fluid and flexible than those outlined above.

Turning now to consider the actual technology used in telemedicine systems, interactive television was in fact very common. Indeed, of the twenty telemedicine projects detailed in Park's (1974) review of US telemedicine, eighteen of them made use of television in at least some manner. The exceptions were the Nebraska slow-scan radiology project (see Park, 1974 and Armstrong et al., 1975) and the Alaska ATS-6/F radio-satellite experiments. Still, even in those projects that did make use of television, some also used alternative technologies as well. For example, the Rural Health Associates telemedicine network made use of telephone to connect one of its satellites with the main hospital (NLM 2009-060: 1), while the Boston Nursing Home telemedicine experiment (which Exhibit 4.15 is derived from) made use of a range of television, telephone and fax. Furthermore, with regards to television technology itself, there was significant variation in the kinds of technology used. Here are some examples:

> **Exhibit 4.16:** "[The telemedicine systems used at MGH] transmit and receive audio and video on the 12 GHz microwave band… [A] camera viewing the patient is under the remote control of the physician, via subcarrier tone channels which enable him to pan, tilt, zoom, and focus the camera, and to vary the lens opening. The patient can see the physician on a monitor placed just above the camera and can talk to him normally via the audio channel through discretely fixed microphones. The image is made more distinct by an electronic image enhancer which sharpens edges that may have been blurred by high frequency losses in transmission" (Andrus and Bird, 1972: 463)

> **Exhibit 4.17:** In the Lakeview Clinics project… [camera], monitors, microphones, speaker, electronic stethoscope and videocassette recorder all are housed in readily moveable television carts…
>
> All patient rooms, ICU-CCU, emergency rooms and conference rooms… are wired so that a hospital attendant can roll a television cart to a location and plug in its power and cable terminals" (Park, 1974: 12)

> **Exhibit 4.18:** "PICTUREPHONE® service, the Bell System's two-way 'see as you talk' video telephone system, is available in certain parts of the country as a switched network service… The dominant consideration in designing the system has been to transmit and display human faces in typically business office environments with enough but not more image clarity than is necessary to visually enhance human to human communication" (NLM 2009-060: 2)

Exhibits 4.16-4.18 describe different kinds of television system used in early US telemedicine projects. Each is different to the others. Firstly, the systems vary in terms of their mobility. While it is not indicated in the Exhibits, the systems described in Exhibits 4.16 and 4.18 used static technology located in fixed places around the health facilities they were installed in. In contrast, the Lakeview (Exhibit 4.17) television system was mobile, allowing them to be moved around and used in a variety of locations. Secondly, the systems vary in terms of their control systems. The television system at MGH was supplemented by a remote control system that allowed the consultant physician to manipulate the camera directly. In contrast, the other systems described in Exhibits 4.17 and 4.18 were reliant on manual operation instead, thus requiring collaboration between the consultant physician and the healthcare provider stationed with the patient. A third point of contrast is the resolution of the image displayed. While the MGH system described in Exhibit 4.16 made use of an image enhancer to ensure quality, the Picturephone system described in Exhibit 4.18 was explicitly designed to transmit an image of just sufficient quality for it to be worthwhile with no further enhancement possible. A fourth point relates to the transmission method. The MGH system outlined in Exhibit 4.16 made use of microwave transmitters to connect sites together. The Lakeview system outlined in Exhibit 4.17, in contrast, made use of coaxial cable instead (Park, 1974). And the Picturephone system made use of standard telephone lines. Other projects not exhibited here, notably the STARPAHC project (Bashshur, 1980) and Alaskan ATS-6/F trials (NLM 2009-060: 2) made use of a satellite relay to transmit data instead.

The implication of this diversity is that the various different telemedicine projects undertaken in the early 1970s were not especially comparable with one another as they were testing a range of different technological devices. However, this technological diversity was also – perhaps – an intended feature of these research projects:

Exhibit 4.19: "[T]he decision was that these are technologies which are going to be helpful in working out complex hierarchical systems with services being provided to different levels. And that when each project got going the interests became that of the – of that particular technology or that particular location" (Maxine Rockoff, interview)

Exhibit 4.20: "I went around and visited lots of places and kind of beat the bushes and said we're going to have this RFP [request for proposals] we'd be very pleased if you'd respond" (Maxine Rockoff, interview)

Exhibit 4.21: "I went to Chicago for example and I asked the people from AT&T who'd developed the Picturephone and made it available to Chicago[. They] had a tariff great for Picturephones. I went to them and went 'do you know of any distressed areas in Chicago where they might find Picturephone useful?' And they introduced me to a poor set of hospitals and pharmacies and clinics and I went out and told them about this and invited them to think about how they might use it" (Maxine Rockoff, interview)

The set of Exhibits 4.19-4.21 outline an account Maxine Rockoff gave in interview about the establishment of the HCTD's telemedicine projects. In the first, it is outlined that the research was being undertaken with a view to developing a large-scale hierarchical healthcare system (more on this below) in which telemedicine would serve as a key logistical element. Hence, focus on telecommunications technologies in the various telemedicine research projects worked towards establishing appropriate technologies for such a system. Rockoff's indication in Exhibit 4.20 that she travelled a lot to generated interest in the HCTD's telemedicine RFP indicates an interest in receiving a variety of grant proposals in response. Exhibit 4.21 expands upon this by detailing one such example where she contacted not healthcare but *telecommunications* providers, with a view to generating projects specifically making use of Picturephone technology being developed by AT&T. Together, these exhibits suggest an interest in generating a diverse array of projects trailing different technologies.

All this said, diversity was also produced in some instances by the use of modified or bespoke technologies:

Exhibit 4.22: "Three custom-built camera carts carry the sound system pre-amp, cables, lenses, headphones, electronics control apparatus, and an 8-inch picture monitoring set" (Wittson and Dutton, 1956)

Exhibit 4.22 is an example of bespoke technology in use at the Nebraska Psychiatric Institute. Other prominent examples include the telemedicine projects run by NASA (i.e. STARPAHC and the Alaskan ATS-6/F trials) which used a number of custom-built components to support the system (AHSL HT 0001: 2/1.1.42; AHSL HT 0001: 2/1.1.17). In some instances, then, telemedicine technologies were adapted or constructed especially for the circumstances in which they were to be used, rather than being based entirely on generic off-the-shelf technology.

Exhibit 4.23:

Independent Variables	
Technical	**Human**

- Resolution
- Color
- Frame rate
  - New frame frequency
  - New frame speed
- Optical adjuncts
- Remote camera controls (pan, tilt, focus, zoom)
- Multiple frame storage
- Multiple monitors
- Self-view monitors
- Terminal locations and ubiquity
- Point-to-point switching
- Terminal portability
- Hands-free operation
- Ability to conference in third terminal
- Ability to make video recording
- Environmental requirements
- Bandwidth symmetry
- Privacy
	- Training level of communicators
	- Familiarity with technology
	- Camera operators
	- Status relationship of communicators
	- Level of mutual knowledge, trust, confidence, and familiarity among communicators

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Moving now towards a conclusion, the final point to be made is that in spite of the centrality of technology to telemedicine, technology was seldom raised as a *question*. Where technology was discussed, it was almost always to describe the technology used in a system rather than to offer an evaluation or comparison between different technologies or evaluate the technology in relation to a specific outcome. Rockoff's (1975: 25; Table III) summary of the HCTD telemedicine projects in Exhibit 4.23 is a key exception. In the table, various aspects of telemedicine systems (human and non-human) have been translated into a set of variables considered to impact on the outcomes of telemedicine use. In the main body of her text, Rockoff goes through these points to describe them and outline their significance. This account is unique in early telemedicine documents, published or otherwise, with only Vivian's (1975) overview of telecommunication devices being close to equivalent. Even in that paper, however, the focus is on describing different technologies rather than analysing them.

To summarise, then, early telemedicine was constituted by a variety of different technologies as well as different *conceptualisations* of the technology of telemedicine. While in both concept and practice interactive television was most prominent, other technologies such as telephone and radio were also used. Even then, the television systems used demonstrate a number of differences between them. Finally, in spite of the centrality of technology, there was very little discussion of technology other than descriptions of it. Technology was therefore a resource, but it was not to any significant extent rendered a question.

Applications of Telemedicine

Moving now to consider various enactments of telemedicine's applications, the overview of telemedicine outlined at the beginning of the Chapter described two broad functions of telemedicine (see Exhibit 4.2). The first of these was that telemedicine can help alleviate the problem of unequal access to healthcare resources. Telemedicine, it was argued, allows technology and expertise to be shared with geographically distant healthcare facilities. Furthermore, it provides a means by which non-MD healthcare professionals can be utilised to provide health services without compromising standards of care. This function of telemedicine was made manifest in the form of clinical service provision. All of the telemedicine systems implemented in the US in the 1960s and '70s were used to deliver at least some clinical services and, for most, this was their primary function (see statistics presented in Armstrong et al., 1975). Systems were used to deliver general health services as well as a variety of more specialist services such as anaesthesiology, auscultation, dermatology, psychiatry, radiography, speech therapy, urology and more.

The second function of telemedicine, in contrast, was that it can serve as a means of integrating otherwise disparate healthcare facilities so as to facilitate collaboration and continuity of care. This second function, however, receives scant attention in Bashshur's text outside of its initial description as shown in Exhibit 4.2 above. Instead, attention is focused on explicating telemedicine in terms of clinical service provision. Again, then, there is a tension in Bashshur's overview: while telemedicine is conceptualised as having functions outside of direct clinical services, these are never made manifest in any detail in his text.

Similar again to the issue of technology, definitions of early telemedicine worked to erase its non-clinical applications and functions. Returning to Bird's and Park's definitions of telemedicine presented above (Exhibits 4.12 and 4.13), for example, neither imply non-clinical functions whatsoever. This aside, there is also a general absence of discussion of non-clinical telemedicine outside of very specific examples of it in practice. For example, neither of the two telemedicine books published in the 1970s (i.e. Park, 1974 and Bashshur et al., 1975) contain chapters discussing non-clinical applications. And even in cases where telemedicine was used for non-clinical purposes, there was no guarantee that this would be turned into a discussion or even noted in reports or papers. For example:

> **Exhibit 4.24:** "To reiterate the utilization of telecommunications within our project is one of many ways we are attempting to improve the accessibility, availability and the quality of care to patients in our area. As a result we are attempting to use it in any situation in which distance and time is a problem. We are certainly aware of its capabilities in terms of primary patient care but feel that in our particular concept of health that the telecommunications system will have its greatest impact in the interactive dissemination of information between peer groups and in the interactive dissemination of educational material for both providers and consumers of care" (NLM 2009-060: 1)

> **Exhibit 4.25:** "This project was undertaken to investigate public and provider acceptance of telemedicine (the use of video telecommunications in medical care) and other innovations and their efficiency in redressing the acute problems of manpower and facility shortages in rural areas. Data were gathered from a probability sample of families that represented the population of Franklin County, Maine, a sample of telemedicine users of the innovative program, together with a comparative sample, and a complete survey of the providers of care" (NLM 2009-060: 1)

Exhibits 4.24 and 4.25 both relate to the telemedicine project undertaken by the Rural Health Associates (RHA) medical group based in Maine. The first, Exhibit 4.24, is taken from the response to a survey initiated by Rashid Bashshur prior to the Ann Arbour telemedicine conference in 1973. The Exhibit outlines how, at the time, RHA planned to move away from clinical telemedicine towards alternative applications such as education instead. Indeed, non-clinical functions, including administration, education and general communication already accounted for 60% of the telemedicine system's usage according to the same questionnaire response. The second Exhibit, 4.25, is taken from a summary of the RHA telemedicine system produced several years later in 1977. Written by Bashshur, who had worked on the project for the purposes of evaluation, it focuses *entirely* upon the clinical aspects of the RHA telemedicine system and does not – even slightly – draw attention to non-clinical practices at all. Accordingly, while non-clinical practices were a significant element of the RHA telemedicine system, in the project's final report this was entirely erased.

In spite of their low profile in published literature, however, non-clinical applications of telemedicine were nevertheless varied and fairly common. Education and training, already touched upon with regards to the RHA, was perhaps the most prominent:

> **Exhibit 4.26:** "The In-Service Nursing Education Department of the Medical Centre Hospital of Vermont had regularly sponsored a continuing education program called the Doctor-Nurse Lecture Series. The nursing service at Central Vermont Hospital did not have the capability to offer a comparable program to their nursing staff although they did recognise the need and usefulness of such a program.
>
> "Provisions were [therefore] made to extend the Medical Centre Hospital lecture series to participants in the Central Vermont Hospital via the New Hampshire/Vermont Medical Interactive Television Network" (Sanborn el al., 1973: 449)

Exhibit 4.26 is an example of health education via interactive television undertaken by the INTERACT telemedicine project which operated between sites in New Hampshire and Vermont from 1968. The Exhibit outlines how a course was offered to make up for the inability of one site run a similar training course by themselves. Drawing from a different but similar example, the "format was primarily lecture, discussion, and demonstration [while visuals] such as overhead projectors, slides [and] chalkboards... were used frequently" (Sanborn et al., 1974: 1055). This kind of educational practice was a common use for the

INTERACT system, indeed, it had been established primarily for educational purposes which accounted for an estimates 80% of the system's usage (NLM 2009-060: 1).

Education was also an important aspect of the telemedicine system operated at the Nebraska Psychiatric Institute (NPI). Again, training and education were the original functions of that system which was only later expanded for clinical use as well (for detail, see Chapter 5):

> **Exhibit 4.27:** "The most significant use of the television here has been as a tool in classroom education…
>
> "The efficiency of television teaching can be demonstrated with just one example. Training usually includes watching and hearing therapists conduct patient interviews. The customary method is to crowd three to six students in back of a one-way mirror. Although we have seventeen one-way mirror installations with sound pick-up, only a small number of students can learn this way. By televising the interview, using live sounds and close-ups of faces, nearly 200 students can learn simultaneously – and see better" (Wittson and Dutton, 1956: 13-14)

As is implied by Exhibit 4.27 the use of television as a device for teaching at the NPI was designed with the particularities of psychiatric training in mind. Through the television system, it was possible for live demonstrations of psychiatric practice to be given to much larger numbers of students then would normally be possible and as the system expanded to other institutions around Nebraska and to neighbouring states, such teaching could be disseminated even more widely (see Wittson and Dutton, 1957). This increase in efficiency can be linked back to Bashshur's overview of telemedicine and its purpose. Like ordinary medicine, psychiatric care in the US was constantly considered to be suffering a major staffing crisis throughout the 1950s, '60s and '70s (see for example: Spectre, 1955; Grob, 1991). The increased efficiency of teaching afforded by the NPI television system therefore worked to resolve this problem by increasing the rate at which new psychiatric health practitioners could be trained (Wittson and Dutton, 1956). Hence, although it was a very different practice to clinical telemedicine, education and training through telecommunications technologies worked towards some of the same.

It is ironic, then, that education and training were never explicitly conceptualised as a part of telemedicine practice per se. Indeed, as with the case of RHA above, even in instances where it was made manifest it could end up being ignored entirely. For example, at a telemedicine

workshop arranged by the HCTD in 1973, Drs. Seibert and Sanborn (NLM 2009-060: 2) of the INTERACT telemedicine project presented a paper focused on the use of telemedicine in education. In the subsequent discussion, however, focus was entirely on the clinical aspects of the system which had received little attention during the presentation. Hence, the subject of education was erased even in the context of interpersonal discussion.

> **Exhibit 4.28:** "There have been indications that the physicians' experience of actually observing their patients' interviews on the TV monitor has had a considerable educational impact... This experience seems to dispel the mystery surrounding psychiatric work. It confronts their fantasies about what it means to interview psychiatric patients with a reassuring reality and it provides an opportunity to identify with a person who is comfortable with such interviewing. It also gives them an increased sense of their capacity to do likewise" (Solow et al., 1971: 1686)

As well as formal education, telemedicine practice afforded in some instances the opportunity for informal education as well. Exhibit 4.28 is one example of this derived from the INTERACT telemedicine system. By way of context, the system was set up such that the patient receiving psychiatric services would be left alone to interact with the remote psychiatrist via television, while the patient's local physician would observe the interview from an adjacent room. Hence, not only did this system provide a means by which patients might receive psychiatric services but it also constituted a means by which physicians – who were sometimes sceptical or even hostile towards psychiatry (Park, 1974) – might learn about psychiatric practice.

> **Exhibit 4.29:** "If an active, meaningful, and balanced program of work, learning experiences and social-recreational outlets could prevent the occurrence of behavioural responses secondary to isolation and deprivation, then the logical consultative approach was primary prevention. It was with this decision that led us to plan our TV sessions and monthly visits with considerations of in-service staff training foremost in mind. Accordingly, one hour a week was devoted to discussing general treatment principles for the mentally retarded… and suggesting ways the staff could apply this extended knowledge when working" (Menolascino and Osborne, 1970: 159)

In a similar vein to Exhibit 4.28, Exhibit 4.29 outlines another way in which education was made manifest in telemedicine practice. In this instance, which relates to the NPI telemedicine system, telemedicine is described as having been used for in-service training of psychiatric nurses working at a large, remote psychiatric hospital. This training, however, constituted only part of a more general organisational scheme whereby the nurses were placed under the supervision of psychiatrists stationed at the NPI. Hence, in addition to training, the television system was used to talk through problems and difficulties with the nurses regarding specific patients or with ward management generally, to discuss and implement new strategies for organising and running the wards, and so on. In addition, there was some use of the television system to provide direct clinical services to patients, but this was secondary to the remote management of the ward which took priority for being a preventative measure rather than a cure (this is alluded to in Exhibit 4.29).

> **Exhibit 4.30:** "It is easy to see how from the supervising point of view, that this system allows the chairman of the department to be in direct personal contact with every aspect of his department. On the other hand it allows residents, staff, and patients immediate access to him with minimum interference with his work. This improves care in that all services and personnel are integrated into a single team" (NLM 2009-060: 2)

Exhibit 4.30 is taken from a paper reporting on the telemedicine system used at Cook County Hospital. This system was unusual in that it was used only internally as a means of communicating between different parts of the same hospital rather than between different medical sites (Park, 1974). As indicated in the Exhibit, one purpose for this communication was the supervision of health workers by the Chairman of the department the system was installed in. However, this supervision was not clinical but administrative, with the Chairman using the system as a means of keeping up-to-date with work being done:

> **Exhibit 4.31:** "With regards to the question of improvement of administrative control, the Chairman of the Department feels that his time is far more efficiently deployed, that he has a constant and current impression of the matters which are of concern in his Department. He attributes this to the ability to attend to almost any matter or question at the time that the question arises" (Park, 1974: 89)

The Cook County system, then, functioned as a means of integrating more closely the Chairman and the rest of the department staff. But it was also used as a means of developing the interpersonal skills of healthcare practitioners in the hospital as well:

> **Exhibit 4.32:** "It is a policy of the Department of Urology at the Cook County Hospital to show patients that members of staff are concerned about them, care about them. The staff is encouraged to know the names of all patients, their occupations [etc.]… Picturephone is an extension of that 'caring' posture. Staff members are instructed to use it to establish contact and relationships with the patients. In order better to use the Picturephone it was recommended to the staff that, when using Picturephones, they set the instrument for the 'view self' mode. In this way, the caring professional sees not the patient but himself/herself and begins to get a view of the way in which his or her manner is projected to the patients. Thus, the Picturephone becomes a training aid for patient contacts rather than merely an end in itself" (Park, 1974: 88)

The excerpt in Exhibit 4.32 outlines what was a unique use of telemedicine at the time. Here, and in the Foucauldian sense (Foucault, 1979), the system was used as a means of disciplining hospital staff by requiring them to observe and reflect on their own demeanour when working with patients. Hence, the use of telemedicine at Cook County was in fact very far removed from Bashshur's version of telemedicine outlined above, concerned not with improving access but with developing the interpersonal skills of staff and improving efficiency of communication and administration.

> **Exhibit 4.33:** "The decentralization created many problems which affected the lines of communication between the health care units. These problems included poor flow of information, inadequate and tardy information, etc. Hence, it was decided to apply for a contract to test out various types of communication systems which might assist in administering and managing a widely dispersed health care system. The installed system consists of Picturephones and two-way black and white TV with disk storage for records, orders, etc." (NLM 2009-060: 2)

Exhibit 4.33 describes the decision to apply for funding for a Picturephone telemedicine system at the Bethany/Garfield hospital complex in Chicago. The hospital complex consisted

of two hospitals, two storefronts and three drug rehabilitation centres located within a square mile of one another (Park, 1974). This dispersal, as indicated in the Exhibit, produced organisational, administrative and logistical problems. Accordingly, as in the instance of Cook County above, the telemedicine system was installed with administration and communication as key functions. Thus, alongside clinical services the system was used for inter-site meetings, data processing, transmission of prescription information, and so on (NLM 2009-060: 2). However, while the Cook County hospital telemedicine system was highly centralised with the Chairman at the centre of the system, the Bethany/Garfield telemedicine system here was much more distributed, with staff members developing new uses for the system as it became more integrated (Park, 1974).

> **Exhibit 4.34:** "A joint grand rounds [sic.] is shared weekly by professional staff and students at both institutions. Responsibility for content alternates between NPI services and Norfolk State Hospital" (Benschoter, 1967: 473)

> **Exhibit 4.35:** "Staff members at both institutions use the two-way system to discuss their projected invetigations, to get advice on research design, and to present research findings at seminars and staff meetings" (Benschoter, 1967: 476)

> **Exhibit 4.36:** "Two-way television is used about eight hours each week to make it possible for patients to see and talk with their relatives in the Omaha area… Since distance, inconvenient public transportations, expense, or health and family problems frequently prevent the family from making the trip to Norfolk, TV visits play an important role in keeping the absent member 'in' the family" (Benschoter, 1967: 475)

This final set of Exhibits (4.34-4.36) is taken from a paper outlining the various functions of the NPI telemedicine system. The first two indicate the use of telemedicine to perform mundane non-clinical tasks: grand rounds (Exhibit 4.34) and research collaboration (4.35). In both these instances, the television system is used simply as a communication device in same manner that videoconferencing might be used today. Similarly, in Exhibit 4.36, the telemedicine system is described as being available for psychiatric patients to communicate with their distant families. Again, while this is a novel use of the system it is also quite

mundane – the system is used ultimately for the entirely banal practice of conversation between participants.

These final examples demonstrate how wide-ranging the use of telemedicine was in the 1960s and '70s. Early telemedicine users in fact actively experimented with many possible uses of telecommunications technology that had little if anything to do with the direct provision of health services. Yet in both published literature and formal discussion, this experimentation was more or less erased, with attention instead focused upon the provision of clinical services.

Telemedicine as a Health Care System

In the snapshot of early telemedicine outlined above, the organisational structure of telemedicine was described as a centralised, hierarchical system whereby a central medical facility provides expertise and health resources to remote satellite clinics. This particular conceptualisation of telemedicine holds throughout Bashshur's text and there is no sense of non-coherence as was the case in his consideration of telemedicine technologies and applications. This said, in practice the structure of telemedicine systems was more complex and varied than Bashshur's account implies and the hierarchical system he describes was made manifest in various ways. Furthermore, in spite of the prominence of the hierarchical model in both concept and practice, an alternative notion of telemedicine can be discerned which renders it instead a distributed, non-hierarchical *network*.

> **Exhibit 4.37:** "The Wagner Clinic program provides pediatric services by using special trained nurse practitioners to give patient care. The nurses function with pre-established medical protocols drawn up by physicians. The cable television link is used to facilitate back-up consultation services from distant physicians" (Armstrong et al., 1975: 337)

The outline in Exhibit 3.37 is a description of a 'classic' hierarchical system as articulated by Bashshur in his overview of US telemedicine. Nurses stationed at the Wagnar clinic dealt directly with patients and operated through the use of a formal protocol which was assembled by physicians, while where it was needed the nurses could contact physicians at the Mount Sinai School of Medicine support. Even though the nurses were not always directly supervised by a physician, then, they were nevertheless indirectly supervised by a set of protocols which directed their actions in the physician's absence.

> **Exhibit 4.38:** "The overall objective of the Cambridge, Mass., telemedicine project was to use audiovisual links between three neighbourhood health satellites and a city health centre, Cambridge Hospital, to facilitate physician interaction and consultation with nurse practitioners and patients" (Park, 1974: 76)

> **Exhibit 4.39:** "I would like to point out again that the neighbourhood health center, the training and work of the nurse practitioner, and a backup team of physicians as consultants comprise a system which was established before the introduction of telemedicine. The day to day patient care in the health center did not change with the addition of telemedicine as an alternative for consultation" (NLM 2009-06: 2)

The telemedicine system outlined briefly in Exhibit 4.38 is another 'classic' example of a hierarchical hub-and-spoke design, with nurse clinicians working at various satellite clinics drawing upon the expertise of physicians located at the central hospital. However, in Exhibit 4.39, part of a letter written by one of the project leads to Bashshur, the relationship between telemedicine and its hierarchical structure in inverted. Rather than telemedicine bringing with it a hierarchical form of organisation, Exhibit 4.38 indicates that such a structure was already in place. In this instance, then, telemedicine was added into, rather than productive of, a hierarchical healthcare system.

> **Exhibit 4.40:** "My original concept was that interactive television would be the means of extending the physicians' care to a remote area and the nurse as a secondary agent. However, I now feel that the nurse is the primary instrument and the television will become an accessory instrument depending on the geographical location and the skill of the Family Nurse Associate" (NLM 2009-060: 2)

The excerpt in Exhibit 4.40, taken from the covering letter to an interim report on the Blue Hill-Deer Island telemedicine project, also performs an inversion of the 'classic' hierarchical design. It is indicated in the Exhibit that the Blue Hill-Deer Island telemedicine project was originally designed as a hierarchical system: a skilled nurse was employed to work on the Island with support from physicians at Blue Hill. Yet, in practice the project lead had found

that the remote nurse was highly effective by herself, highlighted no doubt by severe delays establishing the television system which left the nurse working largely independently for several months at the project's outset (NLM 2009-060: 2). Hence, in this version of telemedicine, it is the nurse rather than the physician who is centred. Furthermore, while the relationship between nurse and physician is still hierarchical with regards to their levels of expertise, the relative status between the two is nevertheless flattened by the fact that the nurse works mostly autonomously rather than as a mere extension of the physician. Implicitly, this inversion also challenges the insistence that telemedicine must replicate closely existing clinical practice (Exhibits 4.6-4.10 above) seeing as how the reliance on autonomous nurse practitioners was a novel form of healthcare service delivery at the time.

Whilst all these examples demonstrate more or less small variations in the how the hierarchical model manifested in practice, there were also different conceptualisations of the hierarchical model in relation to the US healthcare system generally:

> **Exhibit 4.41:** "As Dr. John H. Knowles, MGH General Director, has predicted, telemedicine will revolutionize the practice of medicine. Dr. Leon Eisenberg, MGH Chief of Psychiatry, envisions a trained nonphysician delivering first-line care to patients in a rural community. Backing up that allied medical practitioner would be a telemedicine system with a physician responsible for care in an area with several such communities" (NLM 2009-060: 2)

Exhibit 4.41 demonstrates what might be described as a 'basic' hierarchical telemedicine system where satellite clinics are supported by physicians at a central hospital. But it goes on:

> **Exhibit 4.42:** "Dr. Kenneth T. Bird, founder of telemedicine, would carry that concept a step further to include consultations between a number of these first-line physicians and a teaching hospital. The allied medical practitioner would handle the routine problems, consulting the physician over television when he needs help. In turn, if some specialized problem arose, the physician would present the patient over the television to the teaching hospital" (NLM 2009-060: 2)

In this follow-on to Exhibit 4.41, Exhibit 4.42 describes an extended telemedicine system which links not only satellite clinics to a central hospital but in turn links several hospitals to a central teaching hospital. What emerges in Exhibit 4.42 then is the notion of telemedicine as an extended network of healthcare facilities all arranged into a hierarchical, centralised network to maximise the distribution of healthcare resources. This notion was most thoroughly developed by Maxine Rockoff in a planning document submitted to the HCTD in the early 1970s:

> **Exhibit 4.43:** "[C]ompeting system performance characteristics, economy and efficiency from the providers' point of view and responsiveness and quality from the consumers' point of view, lead us to consider among the new health care system models those that are hierarchical in structure, with highly-skilled personnel and costly equipment centralized in large tertiary care centres in order to use these scarce resources efficiently, secondary care somewhat less centralized at smaller hospitals and physicians' officers, and primary care decentralized to increase the access to health care of the medically underserved" (NLM 2009-060: 2)

The document from which Exhibit 4.43 is taken – referred to as the Logistic Program Plan (Maxine Rockoff, interview) – was of critical importance for the HCTD's interest in telemedicine in the 1970s. The document itself, as implied by the Exhibit, laid out a plan for a radical, rationalized reorganisation of US healthcare premised upon a hierarchically organised network of healthcare facilities to maximise efficiency and access to care. Critical to the system was telemedicine which, through allowing healthcare facilities to share resources, provided a means of overcoming many of the logistical problems of the design. Though it was implicit, this vision of US healthcare also tied into concurrent discussions relating to the idea of health maintenance organisations (HMOs) – collaborative healthcare organisations spanning multiple sites with flat or pre-paid fees rather than fee-for-service charges (Schwartz, 1972; Maxine Rockoff, interview). As HMOs required inter-site collaboration, telemedicine was in principle a powerful tool for establishing and maintaining them.

> **Exhibit 4.44:** "Dr. Campbel outlines his plans for developing an affiliation with a number of hospitals to the west and north of his own in order to increase the population served by his own medical centre 1,500,000. He anticipates that with such affiliation, the medical centre will be able to maintain the delivery of tertiary care as its principle role,

while the other, smaller, hospitals will give primarily secondary care to their surrounding neighbourhoods" (Rockoff, 1971: 1)

In contrast to this hierarchically organised vision of healthcare, Exhibit 4.44 articulates – albeit implicitly – an alternative version of healthcare organised by telemedicine. This Exhibit describes a hierarchical system, but it is described not in terms of improving patient access to healthcare resources but, instead, in terms of improving the *hospital's* access to potential patients. In other words, telemedicine is envisaged as a means by which hospitals might overcome the problem of geography and produce a true free-market healthcare system in which healthcare facilities across the nation can compete with one another on equal terms. The project described, it should be noted, never transformed into an actual project-in-practice, nor was this idea of market-access a concept that appeared elsewhere in any of the documentary material examined. As such, the version of telemedicine performed through Exhibit 4.44 is a version of telemedicine that never truly was. Nevertheless, it is significant if for no other reason than demonstrating a version of telemedicine that might have been under different circumstances.

Another conceptualisation of telemedicine as a system of care saw it as a means of providing health services to patients outside of the context of regular medical spaces. For example:

Exhibit 4.45: "I spoke with Dr. Jerry Loftus, head of the trauma unit of Mercy Hospital... [who] would like to use Picturephone to extend health services to a ghetto area near Mercy. In particular, he would like to link a lockable room in a public housing project (200 families in one building) with the pediatric clinic at the hospital. He said that many mothers simply seek health information, and that right now they must go to great trouble and expense to get to the clinic. He feels that many such trips could be avoided if the mother could see and talk to a doctor via Picturephone. He proposes to establish office hours in the morning and evening and to staff the housing project end with either a resident (he felt the experience would be valuable) or a Vietnam-trained paramedic" (Rockoff, 1971: 2)

Again, Exhibit 4.45 is an example of a telemedicine system that never was. However, it nevertheless exemplifies the idea of using telemedicine to provide services to patients

outside of the hospital or clinic. A similar concept was envisaged by Kenneth Bird, but on a much larger scale:

> **Exhibit 4.46:** "'When it evolves, our coaxial cables will have the capabilities of transmitting 80 to 120 channels. Just visualize, then, a city in which every private home, and every apartment and every public area that wants to take part will have an average of 100 television channels coming in.'
>
> "Dr. Bird would like to see many of these channels set aside as two-way communications... Those channels would be used for education of all kinds.
>
> "'In the health area alone,' Dr. Bird said, 'on a given night we might have a program for patients with diabetes, for example. They would hear a discussion on one of the channels about some aspect of that disease…'
>
> "Dr. Bird also envisions a wide use of television within the hospital of the near future. A patient would be able to watch televised programs originating in the hospital to explain procedures he is awaiting…
>
> "To answer specific questions he might select a channel connected to the hospital telemedicine centre. A health educator in the centre would be available to use visual aids in answering" (NLM 2009-060: 1)

In Exhibit 4.46 telemedicine is transformed into a ubiquitous, total system which provides access to healthcare services directly to peoples' homes. This vision of telemedicine is, in fact, more akin to a dream more than a serious concept, although it nevertheless anticipates several contemporary applications of telecommunications technology in medicine. Still, it demonstrates how in some instances the potential of telemedicine to transform medicine was conceptualised to be more or less limitless. Bird's futuristic vision of mass communication via interactive television also constitutes a shift away from the notion of telemedicine as a hierarchical system and begins to reconstitute it in terms of a general communications system instead. This was similarly the case with regards to the RHA telemedicine project:

> **Exhibit 4.47:** "During the short time which we have been able to utilize our system fully, there has been a general feeling of increased closeness with the three facilities which

have the interactive TV network. The third satellite facility which does not have the interactive TV does not seem to have the same kind of closeness in terms of personnel interaction as is evidenced by those that have the new technology. Although this is not a scientific study by any means, this tends to lend credence to our feeling that this type of communications may be necessary to maintain the stability of a dispersed group of providers under a common administrative fold" (NLM 2009-060: 1)

Exhibit 4.47 is part of a response to Bashshur's survey of telemedicine projects undertaken in 1973 (the Exhibit follows directly on from Exhibit 4.23 presented above). Written in reference to the RHA telemedicine program, it is indicated that one of the main benefits of the telemedicine system employed was its ability to engender closeness and integration between the various sites served by the system. Indeed, it is indicated in the Exhibit that the third satellite which was not connected by television was not as closely integrated as the others, thereby reinforcing the point made. Hence, was indicated above in Exhibit 4.23, the decision was made to shift the emphasis of telemedicine away from provision of services and more towards producing a general communication network for education and collaboration. In doing so, the hierarchical system which had originally been established was implicitly discarded and replaced with which might be better described as a 'network' system constituted by more equal relationships between constituent organisations and staff members. This notion of telemedicine as a network was developed further in the context of the NPI telemedicine system:

Exhibit 4.48: "When this two-way television project was proposed, the NPI and state hospital staff set four specific goals: 1) improved education and training opportunities for state hospital staff at all levels; 2) use of state hospital resources in the teaching programs of NPI; 3) improved state hospital patient services; and 4) increased collaboration of research activity" (Wittson and Benschoter, 1972: 137)

Exhibit 4.48 presents a summary of the general functions of the NPI telemedicine system. Many of these were indicated in more detail in the previous section on the applications of telemedicine. What is significant about these is that they imply a *mutual* relationship between the NPI and the other sites such as Norfolk State Hospital that constituted the network. While staff from the NPI provided clinical services for patients at Norfolk and other

satellite clinics, the NPI also drew upon these other sites for the purposes of teaching material. Similarly, while educational programs were typically run from the NPI, some activities such as grand rounds were shared such that responsibility for leading them alternated between staff at the NPI and staff at Norfolk State Hospital. Furthermore, while in practice little came of this, the system was intended as a means of producing collaborative research between the staff at the various sites as well.

In contrast to those other telemedicine systems outlined in this Chapter, then, the telemedicine system enacted in Nebraska was a distributed and collaborative network. While individual elements of it may have been hierarchical (such as the supervision of ward staff at Norfolk by psychiatrists working at the NPI), overall each site was a mutual and equal collaborator which together constituted a network of mental health facilities which serviced the whole of Nebraska.

To conclude, then, while the notion of telemedicine as a hierarchical, centralised system of healthcare was prevalent both conceptually and in practice, it nevertheless manifested in a variety of ways. Furthermore, and again in both concept and practice, alternative versions of telemedicine emerged which rendered it as a flat and decentralised network rather than a hierarchical structure.

Reflexions: *On Coding and the Pinboard Method*

> [T]he present chapter shall focus on three broad enactments of telemedicine: as a clinical technology; as a communications system; and as a model of health care organisation. Telemedicine as a clinical technology is the most familiar in telemedicine literature… and one of the key ways in which telemedicine was enacted in the 1960s and '70s. However, within this version of telemedicine a multitude of further versions emerged centred around the capacity (and necessity) for telemedicine to allow a replication of extant medical care practice, the types of technology entailed, and the capacity of telemedicine to function effectively.
>
> "Telemedicine as a communications system [in contrast] represents both a practical and conceptual contrast with telemedicine as a clinical tool. While much of the research literature focused on the use of telemedicine to provide direct patient services, the *practice* of telemedicine typically saw it used for educational and administrative purposes as well… [For example,] telemedicine in Nebraska began and continued to entail a significant educational component

> and this was true of several other telemedicine projects as well. Beyond this, however, the nature of the relationship created between health care sites by telemedicine was often understood not as a one-way way provision of services from one site to another, but instead as a collaboration between equal partners.
>
> "[Finally, as] a system of health care delivery, telemedicine stands in contrast not to extant clinical practice but instead the extant model of health care delivery in the US. While telemedicine can be demonstrated to be significantly conservative as regards to its clinical deployment, the principle model of health care delivery which was constituted out of telemedicine research represented a radical reorganisation of US health care"

This quotation is taken from a very early draft of this Chapter. It is also a fair summary of a paper I presented at the EASST/4S joint conference in Copenhagen, 2012 (Craige, 2012), although that paper was not as detailed as the chapter outline presented here would imply.

On the one hand, this old draft is not at all dissimilar to the current and final one. Then – as now – I was concerned with early US telemedicine as fractionally coherent and accordingly my account was – and still is – concerned with enacting the various heterogeneous realities of early telemedicine. On the other hand, however, this early draft is also very different. Yes, it demonstrates a concern with fractionality and non-coherence. But it also insists on articulating that non-coherence through a set of discrete, well-defined categories. In other words, my analysis multiplied reality by defining three non-coherent versions of telemedicine but, at the same time, also worked to reduce reality by subsuming a multitude of heterogeneous realities within a limited set of analytic categories.

This old draft was produced using an approach more or less equivalent to the standard practices of qualitative social research. I began with a close reading of the data I had produced, but moved from that close and detailed reading to the formation of broad analytic categories. When compared with Bryman's (2012: 552) account of coding in qualitative research, the process I employed was markedly similar:

> "The initial coding of a large corpus of data can generate an alarming number of codes. Charmaz… for example, recommends as a first stage in coding for grounded theory 'line by line coding', whereby virtually every line in a transcript

> or other source of data will have a code attached to it. She argues that this process means that the qualitative researcher does not lose contact with his or her data and the perspectives and interpretations of those being studied. However, this process will almost certainly result in a proliferation of codes… What the analyst of qualitative data needs to do is ask questions about what these codes have in common so that they can be combined into higher-order and more abstract codes."

Here, Bryman implicitly describes coding as a process of reduction. It moves the analyst from an "alarming" "proliferation" of codes to a small set of neatly packaged, readily comprehensible categories which bring order to and make sense of the data. Reduction, then, is precisely the point.

So here is the argument. If the pinboard is a method which resists reduction, then it is antithetical not only to narrative but to the practice of coding. Better: it is antithetical to the kinds of 'second-order' coding that are used to turn the mess and complexity of an initial analysis into a small, easily comprehensible set of themes or categories. Indeed, it is my contention here that a refusal to practice that kind of second-order coding is definitive of the pinboard method, for it is in that refusal that the complexity, messiness and diversity of data is maintained.

Hence, the production of the final draft of this Chapter required no more work than had been done originally. I had, already, worked through the data and produced a multitude of different versions of telemedicine in both concept and practice. All that was required was a step back from my previous insistence that the data should be rendered into a set of coherent categories and to adopt instead the disposition that those different telemedicines should be performed on a flat rather than a stratified surface.

Discussion

The four sections above present a pinboard account of early US telemedicine. In the first of those sections, a 'typical' enactment of telemedicine is outlined. It is 'typical' in two ways. Firstly, it is typical because it articulates what were the most common and pervasive elements of US telemedicine at the time. By centring interactive television, clinical applications and a centralised, hierarchical system of organisation, Bashshur outlines in his

account what might be described as the 'average' telemedicine system of the period. Secondly, however, Bashshur's text itself works to render that particular version of telemedicine as typical. In other words, by centring interactive television, clinical service provision and hierarchical structure, these features are enacted by the text as typical elements telemedicine systems and therefore as a basic template for building telemedicine systems of the future. So it is an account of what was, but also an account of what should be.

In the second section, Bashshur's 'typical' version of telemedicine is juxtaposed against a variety of different alternative renderings of telemedicine as a technology, both in principle and in practice. In particular, the centring of interactive television by Bashshur and others (especially Ben Park) is contrasted with decentred conceptualisations of telemedicine where no particular technological form is privileged. Following this, the heterogeneity of interactive television itself is outlined so as to demonstrate that even this near-ubiquitous telemedicine technology lacked a single form or standard.

In the third section, Bashshur's 'typical' version of telemedicine is juxtaposed again but this time in relation to the functions and services provided by telemedicine systems. While the provision of clinical services via telemedicine was of critical importance, a host of other applications including education, organisation, administration and general communication were all significant versions of telemedicine practice as well. Indeed, in some instances these non-clinical applications were just as significant – or more so – than clinical service provision.

Finally, in the fourth section, Bashshur's 'typical' version of telemedicine is juxtaposed once more, here in relation to the organisation of telemedicine systems. In this section, it is demonstrated that the hierarchical and centralised model of telemedicine was only one of a variety of ways in which telemedicine systems were conceptualised and enacted in practice. The most prominent contrast is that of the NPI telemedicine system which was constructed as a distributed network rather than a hierarchical structure. However, other never-quite-real conceptualisations of telemedicine are also demonstrated, including a version of telemedicine where patients were linked directly to medical services in their homes and a version in which telemedicine is used to produce a truly free market of healthcare services.

To move towards a comparison with the accounts of early telemedicine presented in Chapter 3, the first point of contrast relates to the use of cases. As was demonstrated in Chapter 3, accounts of early telemedicine most often present a brief description of a small number of individual telemedicine projects as a way of illustrating early telemedicine practice. In the most extensive accounts – those of Park (1974) and Bashshsur and Shannon (2009) –

descriptions of more or less all the US telemedicine projects undertaken in the 1950s, '60s and '70s are presented. These case-descriptions are critical to the accounts presented and, indeed, their centrality works to perform early telemedicine as an aggregate of individual cases of telemedicine.

In contrast, in this account, there are no cases. There is no discussion or description of discrete telemedicine projects beyond what is necessary to contextualise a particular exhibit. It would be impossible from the account presented here to construct a list of early telemedicine projects or to put together a cohesive account of any single telemedicine system. The cases that constitute the core of other accounts of early telemedicine are fragmented and erased.

Instead, then, early US telemedicine is performed here as an array of different and often contrasting concepts, technologies, practices and systems. Unbound from a concern with explicating coherent accounts of individual cases, the account here is therefore free to explore some other elements of early telemedicine instead. This is particularly significant with regards to the discussion of different conceptualisations of telemedicine since these are not performed by other studies which describe telemedicine through individual cases.

This said, there is not a large difference in the actual content of this account compared with those outlined in Chapter 3. For example, the range of different technologies that are described in the second section of this Chapter above can be discerned also in the various case-descriptions presented by the likes of Park (1974) and Bashshur and Shannon (2009). Similarly, alternatives to clinical applications of telemedicine appear in relation to specific case-descriptions (most notably education in relation to the NPI). In this sense, then, the pinboard account presented here does not articulate much that is 'new'.

What is different, then, is not so much the content of the accounts but their emphasis. While the case-descriptions of early telemedicine projects *imply* a variety of different versions of telemedicine technologies and practices, this heterogeneity is not highlighted or emphasised. In contrast, the juxtapositions and contrasts that are performed by the pinboard account in this Chapter make the heterogeneity and diversity of early telemedicine their main focus.

As a consequence of this, the pinboard account in this Chapter decentres the typical version of early telemedicine that is performed through its histories. As indicated in Chapter 3, accounts of early telemedicine ubiquitously focus on the technology of telemedicine. Furthermore, while non-clinical applications of telemedicine are sometimes indicated, it is the clinical applications of telemedicine which are focused upon (for example, when

explicating the origins of telemedicine). Accordingly, telemedicine is rendered by these accounts as a technology for the delivery of clinical services. In contrast, while the pinboard account presented here explicates telemedicine as a technology and as a means of clinical service provision, it also explicates and emphasises many other applications of telemedicine and various ways in which telemedicine was organised as a healthcare system. As such, the version of early telemedicine enacted through other accounts is displaced from its central position and instead joins a multitude of other, alternative early telemedicines.

In this sense, then, the pinboard account presented in this Chapter has done precisely what it was designed to do. Rather than reduce early telemedicine to a single or narrow set of technologies and practices, early telemedicine instead is performed as a heterogeneous array of different technologies, practices and systems. But here's the problem: more could be written. For example, there is much that could be written about telemedicine as a field of research. Similarly, much could be written about early telemedicine in relation to a number of different subject positions (patients, physicians, nurses, politicians, funding bodies and so on).

This is primarily a practical matter. Brevity requires that these other enactments be omitted, while some (telemedicine research and attitudes to telemedicine) are picked up in Chapter 6 and therefore there would be overlap if they were performed here as well. Regardless of whether these omissions are justifiable, however, their consequence remains the same: these unarticulated versions of telemedicine are erased. Thus, if the account presented in this Chapter decentres telemedicine as a technology of clinical service provision, then it nevertheless simultaneously centres telemedicine as an array of different forms of healthcare organisation underpinned by different technologies used for a variety of different functions. While this is clearly a more generous enactment of telemedicine than the one it replaces, it nevertheless constitutes a reduction.

The implication of all this is that however much the pinboard works to avoid reduction through articulating heterogeneity and difference, it nevertheless runs up against the practicalities of doing social research. This is not problematic per se: the account produced in this Chapter is still broader and more alert to the heterogeneity of early telemedicine than those other accounts presented in Chapter 3. But it also points towards the conclusion that no pinboard will ever be 'complete' and that a pinboard account should never be interpreted as such.

Chapter 5

The Pinboard in Practice II:

Telemedicine in Nebraska, 1950-1960

This Chapter is the second of three case studies exploring the pinboard method via the empirical case of early US telemedicine. While in the previous Chapter an overview of early US telemedicine was presented, here the focus is instead on a single case: the television system employed by the Nebraska Psychiatric Institute from the middle of the 1950s. By focusing on this case, the Chapter produces an account of the Nebraska system as it emerged through describing various enactments of that system and some of the contexts a part of which it developed as.

The Chapter is therefore divided into four sections. In the first, an outline of Bashshur and Shannon's (2009) explanation for the development of telemedicine is presented so as to juxtapose it with the argument to be developed in this Chapter. Following this, the second section offer an account of the Nebraskan telemedicine system in the 1950s. The third section then presents a parallel pinboard of mental health politics in Nebraska, demonstrating how the Nebraskan telemedicine system was bound together with it. Then, in the final section, a discussion of the Chapter is presented.

Explaining Telemedicine

In their history of telemedicine, Bashshur and Shannon (2009: 78) advance the following explanation for telemedicine's development in the US:

> "The development and subsequent 'invention' of telemedicine derives from the need to address several critical problems that develop and remain seemingly intransigent despite numerous attempts to resolve them, including inequality in the geographical accessibility of medical care, differential availability of high-quality specialist care, and escalation in the cost of medical care."

To develop this argument, the authors construct an historical account detailing these various issues in US healthcare as well as the policies and strategies which tried and failed to resolve them. They therefore produce a functionalist explanation of telemedicine's emergence which can be paraphrased as follows: 1) US healthcare was afflicted by a number of intractable problems throughout the 20th century; 2) telemedicine constitutes a possible solution to those problems; therefore 3) telemedicine was caused by those problems.

To some extent, this explanation holds. As was demonstrated in the previous Chapter, the use of telemedicine to provide clinical services was commonly justified in terms of alleviating problems in the distribution of healthcare resources. So in this sense, Bashshur and Shannon's argument – that the problems of 20th century US healthcare produced telemedicine – is durable.

Nevertheless, there are two problems. Firstly, the link between the healthcare problems outlined and the emergence of telemedicine is taken for granted. In other words, it offers no account of *how* the various difficulties and problems in US healthcare resulted in the emergence of telemedicine. Secondly, the explanation only holds in so far as telemedicine is reduced to its functions and, even then, only very specific functions at that. Accordingly, Bashshur and Shannon's explanation is reductionist as well. Thus, while their account holds well enough, it is only one way of accounting for the emergence of telemedicine.

This question of telemedicine's emergence is taken up in this Chapter but in a more specific manner than Bashshur and Shannon. Rather than produce an account of telemedicine's emergence in general this account focuses on only a single instance: the television network which was developed from the mid-1950s in the US state of Nebraska. The Nebraskan telemedicine system is focused on because it is one of the few individual telemedicine projects for which there is a substantial amount of data available. In addition to this, however, the Nebraskan telemedicine system is commonly recognised as the first example of television-based telemedicine in the US (see Chapter 3) and it developed more or less independently from the other telemedicine projects which were established in the late-1960s or early 1970s. Hence, the Nebraskan case is more readily bounded by virtue of its own distance from other examples of early telemedicine research and practice.

The argument is developed in two parts. In the first, a pinboard description of the Nebraskan telemedicine system is presented. Here, the account is similar to the account developed in Chapter 4. In the second part, however, focus is shifted from the television system to those things it was connected to, most notably the Nebraska Psychiatric Institute and the politics of

mental healthcare in Nebraska. In so doing, this second part produces a contextual pinboard and, through various Exhibits, demonstrates how the television system was both a part of this heterogeneous context and also performed it.

CCTV at the Nebraska Psychiatric Institute

The use of telemedicine in Nebraska began in 1955 when a CCTV system was installed for internal use in the newly constructed Nebraska Psychiatric Institute (NPI) in Omaha:

> **Exhibit 5.1:** "Anticipating the rapid development of closed circuit television as a teaching and training tool, the Nebraska Psychiatric Institute was designed and built with camera-cable conduits and a complete television system with sound" (Wittson and Dutton, 1956: 11)

As indicated in Exhibit 5.1, the NPI was designed specifically to accommodate the use of CCTV as a cutting-edge training and teaching tool. Basic tests had been carried out in 1953 to examine the possibility of using CCTV at the new Institute (MLM NPI: 3) and on the basis of these tests the director of the NPI, Cecil Wittson, insisted that the necessary infrastructure be integrated into the new building. However, it was not anticipated that the technology would be sufficiently developed when the NPI opened (MLM NPI: 3). Towards the end of the NPI's completion, however, Wittson pushed for additional resources to fund the CCTV system within six months of opening the CCTV system had been installed and was fully operational.

The CCTV system implemented at the NPI was not just an ancillary element of the new Institute but an integral part of its design and functioning. This is demonstrated further in Exhibits 5.2 and 5.3:

> **Exhibit 5.2:** "The Nebraska Psychiatric Institute is a hospital dedicated to the instruction and trailing of all professional persons having to do with mental health… The building had to be flexible in design. In projecting the teaching and training activities we estimated that about 1000 individuals would receive some instruction or training in the Institute each year. This meant, among other things, that special precautions had to be taken to protect the patients' rights. Special attention had to be given to the problem of traffic; provisions had to be made for indirect as well as direct observation. Ample

examining, demonstration, lecture and seminar rooms had to be included so that the teaching program would not interfere with patient care" (Wittson, 1955: 14)

Exhibit 5.3: "[T]he aforementioned considerations played a major role in the planning and design of the Institute… Use has been made of various teaching aids such as 17 one-way mirrors with two-way sound equipment, a multiple camera television system, and other special observational devices" (Wittson, 1955: 14)

Exhibits 5.2 and 5.3 are taken from a journal article published in 1955 outlining the newly constructed NPI. Exhibit 5.2 describes some of the issues which were considered when designing the building, specifically problems related to the use of actual patients in psychiatric education. Following this, Exhibit 5.3 enacts the CCTV system as one of the teaching tools that was used to resolve this design problem. Hence, the CCTV system is rendered here an integral element of the NPI's design, with the implication that the television system was vital to the functioning of the new Institute.

Exhibit 5.4: "Three cameras can be operated as far as forty feet away from any of the six cable outlets on the conduits built into the Institute. Several conduits terminate in special small closets (camera-ports), which observe interview or treatment rooms through a one-way mirror. In order to get a satisfactory picture, the scene being photographed through the mirror must be well lighted. Rooms connected to camera-ports have ceiling microphones and adjustable ceiling lights" (Wittson and Dutton, 1956: 11)

Exhibit 5.4 presents a brief description of the NPI CCTV system. It indicates that this early CCTV system was used not to connect different healthcare facilities but instead to connect different parts of the NPI building instead. Furthermore, the system was only one-way: it allowed staff and students to observe patients during interview and therapy sessions but it did not allow interaction with them. Hence this early CCTV system was rather different when compared with the telemedicine systems which would emerge in the mid-late 1960s focused on in the previous Chapter.

As was indicated in Exhibits 5.1-5.3, the CCTV system at the NPI was installed as a teaching and training tool. But in this capacity it was used in the variety of ways.

> **Exhibit 5.5:** "One of the main difficulties in teaching psychiatry is in demonstrating certain types of patients to groups of students or trainees. For example, it is impractical, often psychonoxious, and physically hazardous to remove certain patients from their rooms or treatment areas to a demonstrating room or lecture hall. Yet if medical students are to learn how to deal with psychiatric emergencies in their own communities, these cases must be demonstrated to them. Most lecturers are reluctant to make explanatory remarks in the presence of a patient. Television affords the opportunity to present live clinical material to groups of junior and senior medical trainees" (MLM NPI: 3)

In Exhibit 5.5, CCTV is explicated as a solution to basic problems in psychiatric teaching and training. This is reminiscent of the account presented in Exhibit 5.2 above, except here the logistical problems faced in the design of the NPI are generalised to psychiatric education as whole. Hence, here the use of CCTV is not enacted specifically with regards to the needs of the NPI but in general terms as a solution to the problems of teaching with 'live' psychiatric patients. By extension, therefore, CCTV is enacted here as a means of improving the quality of psychiatric teaching and education by allowing students to experience psychiatric conditions first-hand when ordinarily would have been impossible.

> **Exhibit 5.6:** "[A]s in most other medical schools, sophomore teaching is still by necessity largely didactic. There is a need to present to a whole class of second year medical students illustrative cases. This will be easily accomplished by projecting a large-size television image in the Institute auditorium" (MLM NPI: 3)

The excerpt in Exhibit 5.6 also enacts CCTV as a means of improving the quality of psychiatric education but it also relates to the volume of teaching as well. Through CCTV, illustrations and examples of psychiatric conditions can be shown to large classes while ordinarily it would be necessary for students to observe in small groups (on this, also see Exhibit 4.27 in Chapter 4).

> **Exhibit 5.7:** "We have encouraged our faculty to write shooting scripts in a standardized 'television-documentary' style, even though many programs involve patients and a large proportion of ad-lib dialogue…
>
> "We are trying to use television for teaching situations that cannot be handled as well by any other method. Television is an advance in terms of the number of students that can be taught at once. It seems to be an improvement also in terms of the effective teaching of some subject-matter. For example, a close-up of a patient's face during an interview can teach some things better than any lecture" (Wittson and Dutton, 1956: 13)

While Exhibits 5.5 and 5.6 were taken from a document prior to the implementation of the CCTV system, Exhibit 5.7 is taken from a paper published in 1956 outlining the use of CCTV at the NPI "[a]fter a year of experimentation… trying a variety of program formats" (Wittson and Dutton, 1956: 11). Hence, Exhibit 5.7 presents a description of how the CCTV system was used in practice after its implementation. The Exhibit indicates that teaching materials were produced using methods and practices borrowed from the film industry, resulting in what amounted to live educational television shows broadcast to students in attendance in the main 176-seat auditorium. This Exhibit, then, performs the NPI CCTV system as more than a simple observational tool. Rather than being used as a means of observing or demonstrating psychiatric patients or treatments, the CCTV system was used to produce entire teaching sessions which were thoroughly constituted by the CCTV technology and techniques being used.

> **Exhibit 5.8:** "We have started exploring the possibilities of supplementing regular lectures with dramatic sequences intended less to illustrate the material than to impress it on the students with great emotional impact. Powerful television drama can be created on a patient's traumatic experiences, past interpersonal battles, or even hallucinations" (Wittson and Dutton, 1956: 14)

Following on, Exhibit 5.8 describes the idea of using television to produce dramatized films for teaching rather than simply using live patients. Documentary evidence does not make it clear whether this ever translated into actual practice, but the Exhibit nevertheless performs the use of CCTV at the NPI as much more than an observational tool. Indeed, when

combined with Exhibit 5.7 (which is take from the same source) the NPI and its television system take on the form of a television studio as much as a psychiatric hospital (in the 1960s the NPI would receive funding for the production of an audio-visual library, further reinforcing this point; MLM NPI: 1).

> **Exhibit 5.9:** "The Nebraska Psychiatric Institute has accepted its obligation to assist the instruction at our state hospitals. It is not economical of teaching talent to send teachers from the Institute to each of these hospitals except on very rare occasions. But the use of our two-way television we will be able to hold join teaching staff meetings, to permit the state hospital staffs to participate in our visiting lecturer program, and to provide long-distance consultative service" (MLM NPI: 3)

The excerpt in Exhibit 5.11 returns to before the CCTV system was implemented. Here, the system is rendered much more closely to the versions of telemedicine which would emerge in the 1970s. While focus remains on education, the CCTV system is described here as facilitating training and education between the NPI and other psychiatric facilities rather than only within the NPI. Moreover, the possibility of using the system for consultative purposes is also indicated. While this system would come to be implemented in practice, however, it was established using telephone rather than television:

> **Exhibit 5.10:** "[The NPI] is experimenting with telecommunication to extend its psychiatric teaching program to affiliated hospitals.
>
> "This sound network links the Institute through double-toll circuits to state hospitals in Hastings, Lincoln, and Norfolk, Nebraska; Clarinda, Iowa; Jamestown, North Dakota; and Yankton, South Dakota. Thus it joins four states which recently pooled some of their educational, training and research interests under the leadership of the Institute" (Wittson and Dutton, 1957: 15)

While the telephone system outlined in Exhibit 5.10 implies a focus on teaching and education, it is nevertheless enacted as more of a general communication system through its use as a means of collaborating on research projects as well (more on this below).

> **Exhibit 5.11:** "[W]e anticipate [also] providing instructional programs in the evenings for the general practitioners in the area. Such programs will not be restricted, for obvious reasons, to psychiatry. In the same manner we propose to include nursing groups in the state hospitals and surrounding areas in the off-campus teaching program. Later we anticipate extending such coverage to semi-professional and lay groups" (MLM NPI: 3)

Taken from the same document as Exhibit 5.9 (and therefore from before the CCTV system was implemented), Exhibit 5.11 enacts a further version of the CCTV system as a teaching tool. Here, again, the focus is on inter-site education. But the targets here are not mental healthcare practitioners but other medical practitioners and lay persons instead. Hence, the CCTV system here is enacted as a means of educating and spreading knowledge about psychiatry to those outside of mental healthcare.

In addition to these various education-focused enactments of the NPI CCTV system, some other versions were performed as well. For example:

> **Exhibit 5.12:** "[W]ired television will present numerous research opportunities. For instance, we have been handicapped in our ability to make continuing observations of certain conditions. Television would make this possible" (MLM NPI: 3)

While it is not outlined in detail, Exhibit 5.12 enacts CCTV as a means of doing psychiatric research by allowing patients to be observed discretely and without disruption. A similar version of CCTV was performed in relation to patient management and care as well:

> **Exhibit 5.13:** "[The CCTV system] will have its greatest benefit in the treatment and observation of certain types of depressive mental patients, Dr. Wittson said.
>
> "'Some patients should be under constant observation, yet it's expensive to assign a private nurse,' he said.
>
> "'With the new camera, a TV receiver can be set up near the nurse's station and she can watch several patients at a time" (MLM NPI: 3)

> **Exhibit 5.14:** "Wired television would also be useful in the actual treatment of patients. There are certain types of compulsive, suicidal patients who must be under constant surveillance. A special nurse or attendant seems to them to be a policeman, increasing their guilt feelings. Others are so dangerous that it is just not wise to leave one person alone with them. Television from the seclusion room to the nursing substation would obviate these dangers" (MLM NPI: 3)

Both Exhibit 5.13 and 5.14 outline the same concept: using CCTV to monitor patients at risk of suicide both safely and discretely. Between the two Exhibits, however, there is a shift in emphasis. The first, Exhibit 5.13, is taken from a newspaper article published in a Nebraskan newspaper in 1953. In it, the use of CCTV as a monitoring device is centred through the indication that this would be the system's "greatest benefit". Exhibit 5.14 in contrast, is taken from a letter written by Cecil Wittson to one of the governing bodies of the State of Nebraska to request additional funds for the CCTV equipment. In this second Exhibit, the use of CCTV as a monitoring device has been decentred and is instead auxiliary to the system's main use as an educational tool. Hence, as the system came closer to implementation there was a shift in the way in which CCTV was being enacted with regards to the issue of patient observation and care.

> **Exhibit 5.15:** "The Hospital Facilities Section of the Public Health Service has become quite interested in the T.V. installation for the Nebraska Psychiatric Institute and request that you [Cecil Wittson] furnish a narrative outline of your program for utilizing such equipment.
>
> "They are particularly interested in its use for the diagnosis of patient's illness, observation and teaching of both undergraduates and graduate students, and other possible advantages" (MLM NPI: 3)

Exhibit 5.15 is most of a letter to Cecil Wittson requesting information about the NPI CCTV system on behalf of an arm of the US Public Health Service. It requests information specifically about the use of CCTV for observation and teaching but also about the use of CCTV for the purposes of patient diagnosis as well. In spite of this, however, it is not apparent that this use of the CCTV system was envisaged by Wittson or others in Nebraska at

the time. Certainly, there is no documentary evidence to suggest this. Indeed – and this is the key point – in Wittson's reply to this request the only functions of the CCTV system described are educational ones (MLM NPI: 3). Hence, while the possible uses of CCTV had been broadened elsewhere, in Nebraska the intended use for the CCTV system had in fact narrowed when compared with its initial conception. While originally it was intended to perform a mixture of functions – teaching, observation and research – by the time it was put into operation the significance of functions other than education had more or less been erased.

The NPI CCTV system was therefore enacted in a number of ways. Most generally, it was enacted as an integral part of the NPI's design and functioning. However, it was also enacted with regards to a variety of different functions. While these mostly focused on teaching, there was some consideration of CCTV with regards to psychiatric research and patient care as well. What is also noticeable, however, is that the enactments of CCTV at NPI shifted as the system went from concept to practice. While the enactments of CCTV were centred more on education in actual practice, new versions of the system emerged with regards to the actual practices of teaching. Hence, while CCTV was originally enacted as an observational tool, it became in practice an apparatus for producing educational films.

Telemedicine and Community Mental Healthcare

Exhibits 5.1-5.15 have articulated a variety of enactments of the CCTV system which was implemented along with the construction of the NPI. Following available documentation, these Exhibits have mostly focused upon the uses and functions of that system. As has been implied in the discussion above, the anticipated benefits of CCTV were mobilised a means of justifying and therefore gathering support for its implementation at the NPI. Indeed, a number of the Exhibits are taken from documents seeking funding for the system (i.e. Exhibits 5.11-5.14; Exhibits 5.5, 5.6 and 5.9 also paraphrase arguments made in earlier petitions for funding). Nevertheless, these Exhibits only demonstrate the arguments that were made and do not demonstrate how it was that these arguments were persuasive.

To address this, it is necessary to shift the focus of the account away from the NPI CCTV system specifically and to explore as well some of the things it was related to. Most significant, here, is the NPI itself. As indicated in Exhibits 5.1-5.3 above, the CCTV system implemented at the NPI was an integral part of its design and functioning. Accordingly, enactments of the NPI are of relevance to the CCTV system which supported it.

> **Exhibit 5.16:** "The [Nebraska Psychiatric Institute] has been designed to meet the requirements of its three missions: training, treatment, and research. These functions are closely interrelated and constitute simultaneous, overlapping activities in the prevention and care of mental illness. Instruction in clinical medicine requires that there be patients undergoing diagnoses and treatment. Satisfactory instruction demands that this diagnosis and treatment be of a high level. Thus, the individual patient in the active teaching hospital benefits from superior care. Clinical research has as its goal improvement of existing diagnostic and therapeutic procedures, discovering new techniques of therapy and uncovering causes of illness. These activities lead to improved methods of caring for the mentally ill" (Wittson, 1954: 290-291)

Exhibit 5.16 is an overview of the NPI and its operations. For all that the discussion of CCTV above emphasised the NPI as a teaching institution, the Exhibit enacts education as only a part of the NPI's remit with psychiatric therapy and research also featuring. However, all three areas of operation are themselves enacted in the Exhibit as working towards "the prevention and care of mental illness" and as mutually reinforcing. In this account, then, the activity of teaching is subsumed under the more general goal of preventing and treating mental illness.

This focus on prevention and treatment of mental illness draws upon contemporary transformations in the theory and practice of mental healthcare in the US which was known as the community mental healthcare (CMH) movement (Whittington, 1965):

> **Exhibit 5.17:** "[I]n the past 25 years there has been a pronounced change in our attitude of the function of the state hospital. About the time that Dr. Wittson and I embraced psychiatry [around 1930], there was nothing but custodial care. We housed, fed, and clothed our patients. We gave them medical care and nursing care when they become sick. But there was no such thing as specific therapy. You couldn't treat a patient for their psychosis, all you could do was take them out of the community, house them well, I think we housed them pretty well, and take care of their physical needs. Treatment was non-existent… It has been interesting to note that although the functioning of the state hospital has changed in these 25 years, its relationship to the community and its physical structure has changed very, very little. Today we have therapy and we have treatment in our hospitals. Over the past 25 years there have developed ways and means whereby a

vast majority of the patients who now come to a public mental hospital can be successfully treated if they come to us early enough, if we could have a large enough staff and if the community which we serve is behind us and gives us the things we need. A change in 25 years from hopeless custodial attitudes to a very stimulating therapeutic attitude today" (MLM NPI: 2)

The account in Exhibit 5.17, presented at a conference held at the NPI in 1955, is one rendering of the move towards CMH in the US in the post-War years. By way of context, in the first half of the 20th century those afflicted by mental illness were typically understood as categorically distinct from those who were mentally well. Therefore, as indicated in Exhibit 5.17, the principle purpose of mental institutions had been to care for and look after the mentally ill rather than to treat them (Grob, 1987; 1991). However, as a result of the apparent successes of wartime psychiatry and the dire state of US mental hospitals, a new version of mental illness grounded in psychodynamics emerged in the post-War years which conceptualised mental illness as a continuum instead (Grob, 1991). Hence, mental illness was reconstructed as treatable and (if detected early enough) also preventable (Grob, 1987; 1991; also see Prior, 1993).

In performing this transition, Exhibit 5.17 strongly emphasises the contrast between the old and new versions of psychiatric care such that the gulf between them is rendered exceptionally wide. Nevertheless, it also renders CMH as precarious since the provision of psychiatric treatment is made contingent on early awareness and detection of mental illness, staff availability and the commitment of necessary resources. The three functions of the NPI outlined in Exhibit 5.16 above can therefore be demonstrated as an evocation of CMH. CMH had rendered therapy and treatment a plausible – better, *vital* – activity of mental healthcare and accordingly rendered education and training critical in order to increase the availability of mental healthcare professionals trained in new treatment practices. And research, as demonstrated in Exhibit 5.18 below, was rendered necessary in order to produce knowledge about the causes and possible cures of mental illnesses:

Exhibit 5.18: "[The causes of mental illness] are probably as diverse as are the causes of physical ailments and disabilities. They are in some cases the direct result of physical conditions… One example is the insanity which accompanies many cases of pellagra, and can be cured promptly by curing that disease…

> "In other cases, the mental illness or mental maladjustment seems to be purely psychic. This term, however, may mask our ignorance of the basic biochemistry of the human organism… I wish to say only [then] that in proportion to the importance of the mental diseases… very little research is being done, very few brilliant minds are at work on this huge problem, almost none of the basic and related fundamental sciences are being brought to bear upon this problem with a view to its solution" (United States Congress House Committee on Interstate and Foreign Commerce, 1945: 9)

The NPI, then, was thoroughly embedded in CMH. On the one hand, it enacted CMH through the provision of psychiatric therapy and through psychiatric research and education. But on the other hand it was thoroughly constituted by CMH as well for its activities were thoroughly grounded upon the theory, practice and politics of CMH. However, in documentation pertaining to the NPI, its embeddedness within CMH is entirely implicit. Returning back to Exhibit 5.16, the three activities of teaching, treatment and research are not justified in terms of CMH but instead deployed as taken for granted elements of mental healthcare provision. So CMH is made manifest in the Exhibit through evoking some of its key principles but it is also rendered absent since it is evoked without explication or polemic.

In Exhibit 5.16, then, CMH constitutes what Law (2004: 160) refers to as a "hinterland": "a bundle of indefinitely extending and more or less routinized and costly literary and material relations that include statements about reality and the realities themselves." To paraphrase Law's definition, this is to say that in relation to Exhibit 5.16 CMH is a taken-for-granted set of knowledges and practices which, because they have become undisputed and routinized, constitute an unspoken background upon which further enactments of reality are constructed. The relationship between the NPI and the hinterland of CMH, however, works in both directions. In Exhibit 5.16, the NPI is implicitly founded upon and therefore an enactment of CMH. But, at the same time, the NPI itself enacts CMH through performing its practices and principles. The two therefore constitute one another.

By extension, however, the same argument applies to the NPI CCTV system. In Exhibits 5.5 and 5.6 above, for example, CCTV was enacted as a means of improving the quality and quantity of psychiatric education. Though it is not made explicitly manifest in these texts, these assertions are embedded in the hinterland of CMH since it is through CMH that the value and necessity of psychiatric education was rendered important. In other words, these Exhibits enact CCTV not only as a means of enhancing psychiatric education and training but

also, implicitly, as a means of enacting the principles of CMH. Hence, the NPI CCTV system and CMH were rendered as constituting one another, as well.

The embeddedness of the NPI CCTV system in CMH is of relevance because throughout the 1950s and '60s CMH was performed as a major socio-political issue in several ways. Most basically, arguments were directed at those responsible for psychiatric care and education:

> **Exhibit 5.19:** "One of the major problems exiting in Nebraska, as well as in other states, is the difficulty in staffing the state hospitals with adequately trained personnel. Our state hospitals have a woefully inadequate complement of trained psychiatrists" (MLM NPI: 3)

> **Exhibit 5.20:** "Each of our state hospitals could become a treatment center if adequately staffed. Unfortunately there is a nation-wide shortage of the necessary specialists… The Nebraska Psychiatric Unit has underway a training program for all [kinds of mental health practitioner]" (MLM NPI: 3)

Exhibit 5.19 is taken from a letter written in 1951 by Cecil Wittson to Harold Lueth, Dean of the University of Nebraska College of Medicine. Here, Wittson asserts two things: firstly, that there is a shortage of psychiatric staff available in Nebraska and nationwide; and secondly, that this is a "major problem." A very similar argument is developed in Exhibit 5.20, in this instance included as part of a report to the body responsible for overseeing mental healthcare in Nebraska, the Board of Control. Hence, in both instances, Wittson attempts turn the provision of psychiatric training into a relevant issue for those responsible for funding and supporting mental healthcare and psychiatric education.

> **Exhibit 5.21:** "The number of physicians, registered nurses, social workers, psychologists, therapists, and other professional workers employed is very low when compared with the standards of the American Psychiatric Association. The shortage in professional workers makes it impossible to establish an acceptable therapeutic program and additions must be made to the staff if all the patients are to receive adequate treatment" (MLM NPI: 2)

The statement in Exhibit 5.21 is taken from a report on the state of Nebraska's mental health services produced by the American Psychiatric Association (APA) in 1951. Here, the assertion that Nebraska was suffering from a shortage of psychiatric personnel is supported by the results of the APA survey which lends weight to claims made elsewhere (e.g. in Exhibit 5.19 above) about the importance of expanding psychiatric training in the state.

> **Exhibit 5.22:** "Dr. G. Lee Sandritter, superintendent of the Hastings State Hospital, Monday blamed the State Board of Control for the fact that 1,750 patients will be cared for by a staff of four full-time and one half-time psychiatrist.
>
> "Dr. Sandritter said three of the hospital staff have resigned for positions paying more and providing better training.
>
> "The American Psychiatric Association has established a minimum standard for Hastings Hospital of 23 psychiatrists in addition to administrative personnel" (MLM NPI: 3)

Exhibit 5.22 is taken from a newspaper article published a few years later in 1954. It describes in brief an attack made by the superintendent of one of Nebraska's mental institutions, G. Lee Sandritter, against the state body responsible for overseeing mental healthcare in Nebraska, the Board of Control. The dispute is focused on staffing levels at the hospital Sandritter was superintendent of. His argument, developed later in the article but implied in the Exhibit, is that the pay levels of mental health practitioners in Nebraska were too low in comparison with other states, thereby rendering Nebraska uncompetitive in terms of recruitment. As indicated in the Exhibit, in making this argument Sandritter draws upon the earlier survey by the American Psychiatric Association to support his case that a much larger staff was required. Here, then, the issue of mental health staffing levels is rendered an explicit political issue. But also, through being reported in the news, it is also rendered a salient public issue. Indeed, this issue would attract significant attention as it developed in 1955 and its eventual culmination – Sandritter's resignation in protest of the Board of Control's policies – received significant exposure in local newspapers (MLM NPI: 3).

While Exhibits 5.19-5.22 are all concerned with the quantity of mental health practitioners, similar arguments were developed with regards to the quality of psychiatric education:

> **Exhibit 5.23:** "There is more prejudice among the medical profession against psychiatry and more lack of knowledge of the aids and emphasis of psychiatry than there is of any other professional branch in this country. That is largely due to the poor teaching of psychiatry that has gone on in our medical schools over the past 50 or more years" (MLM NPI: 2)

> **Exibit 5.24:** "[I]t is important to note that prior to the existence of the Nebraska Psychiatric Institute there was no place in Nebraska where doctors could obtain the three years of approved training required for accreditation by the American Boards of Psychiatry and Neurology… [In addition, all] students at the [University of Nebraska] College of Medicine receive instruction from staff of the Psychiatric Institute during each of their four years of training" (MLM NPI: 3)

Exhibit 5.23, presented at conference held at the NPI in 1955 at which several state government representatives were present, asserts that the quality of psychiatric education in the US had been historically poor, hence implicitly rendering the provision of psychiatric services problematic. Exhibit 5.24 is taken from a report to the Board of Control and, similarly, indicates that prior to the foundation of the NPI there were serious deficiencies in the provision of psychiatric education in Nebraska. Hence, in both instances psychiatric education was rendered problematic in accounts directed at representatives of the Nebraskan government.

Psychiatric education in Nebraska was therefore rendered problematic in a variety of ways for those working in state government. But these enactments of psychiatric education themselves drew upon a hinterland constituted by various enactments of CMH and its importance. Here is one example:

> **Exhibit 5.25:** "Jim is an 11-year-old boy referred for psychiatric study because he had been found setting fires around the cattle-chutes at the stockyards. He admits these fire-setting activities quite freely, explaining that he has intentionally tried to set the cattle-chutes on fire; he likes to see how big he can let the fire get and still put it out by smothering it with cornstalks…

> "It is felt that Jim's behaviour, which presents a real threat to the community, is based on a severe emotional disturbance. It is felt that Jim urgently needs and can be helped by intensive psychiatric treatment. However, because of the economic stress in the family… it is doubtful whether much can be accomplished with Jim in his present environment. There is real need here for skilled and intensive psychiatric treatment for Jim on an in-patient basis, for the protection of the community and for the working-out of Jim's problems so he may become an effective and happily adjusted individual in society" (MLM NPI: 2)

Exhibit 5.25 is taken from a document produced by Cecil Wittson in 1951 outlining a case for the new NPI facility opened in 1955. This document, referred to as the 'Black Book', was a "plea for life" (MLM NPI: 3) in response to the eviction of the what was then the Nebraska Psychiatric Unit from its premises at Douglas County Hospital in Omaha. The Exhibit details the case of a young boy diagnosed with psychiatric problems. Included at the very end of the document, its implication is that the boy will not be able to receive treatment if the Psychiatric Unit is disbanded. Accordingly – to draw upon language used elsewhere in the document – it renders the construction of new premises for the NPI a "humanitarian" project which can reduce human suffering and improve lives.

> **Exhibit 5.26:** "The cost [of institutionalised care], which must be borne by [a patient's] fellow citizens, is much greater than appears at first glance. Not only is there the actual cost of maintaining the patient in the state hospital and the cost of his treatment, but also society suffers the loss of the patient's productiveness… The… average duration of a patient's stay in a state hospital is approximately 8.3 years, bringing the total cost of his hospitalization to $41,705.48. When he is presented with this bill the inquisitive taxpayer will want to know why the expense is so staggering. He will also want to know if something might not have been done to prevent this protracted period of hospitalization" (MLM NPI: 2)

Like the previous Exhibit, Exhibit 5.26 is taken from the 'Black Book'. Its enactment of the NPI is quite different, however. Rather than a humanitarian enterprise, it is enacted as an economic and a political endeavour. As an economic project, the high cost of institutionalised care is highlighted with the implication that a facility dedicated to treatment and prevention of chronic mental illness would be an investment which in the long run would

reduce costs and therefore save money. As a political project, it is indicated that it is taxpayers who foot the bill for mental illness as the provision of mental health facilities is a duty of the State. As such, reducing the cost of mental illness reduces the tax burden on citizens or else frees resources for other public works, in either case proving a popular measure.

> **Exhibit 5.27:** "Only recently a committee appointed by Governor Crosby to check up on Nebraska's mental hospitals reported that they were not doing their job, and recommended sweeping changes…
>
> "The institutions criticized are not run by the Governor, but by an independent state agency, the Board of Control…
>
> "[One suggestion for resolving the issue] had come from State Senator Syas. Mr. Syas is considering asking the next Legislature to submit to the people a constitutional amendment that would abolish the Board of Control. If this were done, authority over state institutions would be vested in the Governor… and he could appoint one or more trained administrators who would be directly responsible" (MLM NPI: 3)

Exhibit 5.27 indicates another political implication of mental healthcare care in Nebraska. Here, it is indicated that the competence of Nebraska's BoC was brought into question as the result of an unfavourable review of Nebraska's mental hospitals. Such was the extent of this criticism that the one of the solutions proposed was to disband the Board entirely. Accordingly, psychiatric care is rendered here a matter of political survival for the BoC.

> **Exhibit 5.28:** "In many ways the feeling had developed that the related problems of mental health, of mental deficiency, of old age, and of alcoholism have become crucial tests of the survival of state government in a federal system of government as we have known it. It is felt that if the states fail to handle adequately this number one health problem of modern urban society, it will cast serious doubt upon their ability to fill their historic role" (MLM NPI: 2)

The excerpt in Exhibit 5.28 enacts the issue of mental healthcare similarly to Exhibit 5.27, but here the focus is shifted from state- to national-level politics. Enacted as central to the

question of statehood, mental healthcare is thus rendered a key political concern with significant constitutional implications.

In classic ANT terminology, all of these Exhibits 5.25-5.28 can be understood as attempts to 'enrol' (Callon, 1986; Latour, 1988) various actors – namely those in the Nebraskan government – into the project of CMH. The prevention and treatment of mental illness is rendered variably a humanitarian, economic and political issue thereby making it relevant in a manner of different ways. Hence, these attempts to enrol state actors constitute their own hinterland which the arguments presented in Exhibits 5.19-5.24 all drew upon in rendering psychiatric education problematic. In turn, this extensive political project to render CMH and psychiatric education key concerns of government officials in Nebraska constituted the hinterland which was drawn upon with regards to the implementation of CCTV at the NPI.

To use another classic ANT term, then, there is a chain of implicit 'translations' (Callon, 1986) from the various enactments of CMH's importance to the importance of CCTV as a training tool. If CCTV was a means of overcoming logistical problems in psychiatric education, then it was by extension a means by which psychiatric education could be improved in terms of both quality and efficiency. In turn, improvements in psychiatric education would enlarge the number of psychiatric professionals working in Nebraska and improve their skill, thereby improving the volume and quality of psychiatric care in the state. And finally, through the provision of more and better treatment and prevention, lives would be bettered, money would be saved and various political bodies could demonstrate their legitimacy.

Discussion

This Chapter has presented an account only of the earliest use of telemedicine in Nebraska. In the early 1960s, trials were undertaken to examine the use of two-way television in the provision of group psychotherapy (Wittson et al., 1961). Later, in 1964, a two-way television connection was established between the NPI and Norfolk State Hospital, a traditional mental hospital over one hundred miles from Omaha (Benschoter et al., 1965). This system bore much more of a resemblance to the other telemedicine systems of the late 1960s and early 1970s, although use of that system was significantly more diverse than most (this was discussed in brief in Chapter 4).

At all stages, however, the use of television remained embedded within CMH. Concurrent the establishment of the television system between the NPI and Norfolk State Hospital was the development of a 'long range mental health plan' (MLM NPI: 3) which was an extensive and detailed strategy for enacting CMH in Nebraska. A significant part of this was the

establishment of a number of psychiatric clinics dispersed across the state which would be supported by staff at the NPI. As such, the psychiatric healthcare system emerging from the plan was not at all dissimilar to the hierarchical model of healthcare delivery which developed out of telemedicine research in the early 1970s (see Chapter 4). However, this system was not derived from the idea of using television to provide mental health services but rather from the principles of CMH which stressed caring for and treating mental illness in patients' local communities where possible (Grob, 1991).

The point, then, is that the interrelationship between CMH and Nebraskan telemedicine described above remained constant throughout the 1950s and '60s. Bashshur and Shannon (2009: 163), in their account of Nebraskan telemedicine, also offer a discussion of community mental healthcare as part of their history. It reads, more or less in full, as follows:

> "The Nebraska project was conducted during the height of a national community mental health movement aimed at reorganising the delivery of mental healthcare in the United States by using the local community as a substitute resource to enable the closing of at least some of the larger residential mental hospitals. Several factors spurred deinstitualization, most notably it was thought that the mentally ill active in their communities rather than committing them to mental institutions was a more humane form of treatment. The confluence of several factors resulted in the movement to close long-term state and county mental hospitals. Evidence and stories of routine inhumane institutional care appeared in the public media. At the same time, the introduction of effective psychotropic drugs in the mid-1950s made it unnecessary to hospitalize all mental patients… President John F. Kennedy appointed a Panel on Mental Retardation in 1961. Congress passed the Mental Retardation and Community Mental Health Centre Construction Act in 1963… These changes stimulated a major shift in the locus of care for the mentally ill… [and the] use of telemedicine at [Norfolk State Hospital in Nebraska] accelerated that change"

There is an implicit technological determinism in this account (on this, also see Chapter 3). Though they offer a fair overview of CMH, they relate it to telemedicine only in so far as they say that it 'accelerated' the changes brought about by CMH. Hence, telemedicine is enacted as an external object which acted upon mental healthcare in Nebraska so as to speed up an ongoing process. Their account therefore performs very little of a relationship between CMH and Nebraskan telemedicine to the point that CMH is more or less incidental to their account.

The account which has been developed in this Chapter contrasts sharply with Bashshur and Shannon's rendering. Rather than an incidental external factor, it has been argued through the pinboards above that the Nebraskan telemedicine system thoroughly entwined with CMH.

On the one hand, the CCTV system was implicitly an enactment of CMH. Arguments for the CCTV system were implicitly founded upon the principles of the CMH movement which itself had been performed in such a way as to have garnered political and financial support. But on the other hand, CMH was also performed through the NPI CCTV system as a result of its various educational benefits.

Turning now towards a comparison with Bashshur and Shannon's explanation for telemedicine's emergence outlined at the beginning of the Chapter, it is notable that there are two key similarities. The first is that both accounts heavily emphasise healthcare problems and issues as a context for telemedicine's emergence. Related to this, the second similarity is that both place a heavy emphasis on function. The pinboard above has primarily outlined the various use - in both principle and practice - of the CCTV system while the arguments for using CCTV and for the significance of CMH also lean heavily on practical outcomes. On the one hand, this perhaps points towards the prevalence of functional issues with regards to early Nebraskan telemedicine. Certainly, the emphasis on function is a fair reflection of the data which was available to produce this account. On the other hand, however, there are certain accounts, for example some discussion of staff attitudes towards the system, which were excluded as they did not support the argument being made. This is not unreasonable, as such accounts would serve only to clutter the text. Nevertheless, there is a kind of reduction performed in this account which is not entirely dissimilar to the erasures performed in conventional narrative accounts.

All this said, there are also some points of distinction between the pinboard here and Bashshur and Shannon's explanation of telemedicine. The first point of contrast concerns the contexts which are evoked. The healthcare context that Bashshur and Shannon write about - unequal access to healthcare resources - and the context or hinterland of CMH written about here are very different, even if there is some overlap with regards to shortages of certain professionals. On the one hand this is not unexpected, since the Nebraskan telemedicine system was grounded in mental rather than physical healthcare. But on the other hand, it is also indicative of the reduction that Bashshur and Shannon's account performs. Aside from the paragraph quoted at the beginning of this discussion, the transformations in US mental healthcare from the 1940s onwards are not made manifest in their history. Yet mental healthcare was significant with regards to telemedicine not only in Nebraska, but also MGH, the INTERACT project in New Hamshire and Vermont and the Illinois Picturephone system. Hence, while CMH is of relevance to early US telemedicine more generally, it is nevertheless

subsumed by the narrative of conventional medicine that Bashshur and Shannon produce in their text.

The second point of contrast concerns the way in which they perform the interaction between telemedicine and its contexts. As was argued at the beginning of the Chapter, Bashshur and Shannon's account takes for granted that various issues in health care access and distribution led to the development of telemedicine without explicating how that was the case. In the pinboard account here, however, the account has sought to *demonstrate* the various ways in which Nebraskan telemedicine and the politics of mental healthcare were embedded in one another. Hence, it has outlined for example various attempts to enrol state officials by rendering CMH as variably a humanitarian, economic and political matter. Similarly, it has outlined other arguments directed at state officials articulating the (purported) benefits of CCTV, drawing implicitly upon the hinterland of CMH which had already been established as a matter of import. Hence, it describes a small multitude of translations from CMH to the NPI CCTV rather than simply assuming a relationship between problems and their possible solutions.

In contrast to the previous Chapter, then, it is content rather than emphasis that differs between the account in this Chapter and Bashshur and Shannon's explanation for telemedicine. While both accounts deal with the same theme - uses and functions of CCTV - the account in this Chapter outlines an alternative context within which this specific telemedicine system was embedded. Furthermore, it has also outlined *how* the telemedicine system was embedded in – and reproduced by – that context.

Reflexions: *Multiple Accounts*

This Chapter, too, has a history. It was once a narrative. It told of the emergence of community mental healthcare in the US and how that was enacted locally in the context of Nebraskan politics. It told how this led to the formation of the Nebraska Psychiatric Unit which made manifest CMH in both principle and in practice. It told of how the Nebraska Psychiatric Unit was evicted from Douglas County Hospital and how Cecil Wittson rallied political and professional support for the construction of a new psychiatric facility – the NPI. It told how Wittson became the director of psychiatric services in Nebraska, worked to produce mental healthcare as a critical issue in Nebraskan politics, and set about enacting a long-term plan for the development of psychiatric services in the state. And it told how the use of television

both enacted this mental healthcare revolution in Nebraska and was itself enacted by it.

The argument of the Chapter has therefore remained more or less constant. Both the original and final account worked to explicate how Nebraskan telemedicine was embedded in CMH. The difference, then, is in their details. In comparison with the original narrative version of this Chapter, the current pinboard version develops in greater detail various enactments of Nebraskan telemedicine. More importantly, it produces a broader account of the enactments of CMH as a matter of political concern, most notably with regards to Exhibits 5.27 and 5.28 concerning mental healthcare as a test of political legitimacy. So the pinboards written here do their job and enact some of those otherwise erased realities.

On a practical level, as well, several parts of the story being told in the old version of this Chapter were rendered problematic as a result of the lack of data available. In places, then, it was necessary for the narrative to skip or speculate in order to render it cohesive. Such cohesion does not matter in the pinboard version of this Chapter, however, therefore the pinboard has proven an effective means of dealing with narrative gaps simply by erasing their relevance.

Nevertheless, this Chapter has performed its own erasures of things more clearly rendered in the old narrative. For example, as indicated above the narrative began with the emergence of CMH in the post-war years and demonstrated how it was first made manifest in Nebraska. Such a discussion is absent in this new version. Similarly, Nebraskan telemedicine in the 1960s has been only briefly summarised in this account as further detailed explication of the embeddedness of CCTV in CMH was unnecessary for the purposes of the argument developed here. But in the narrative version of this Chapter, the 1960s telemedicine system was integral to completing the narrative. Hence, again this account has erased certain versions of Nebraskan telemedicine which do not fit with the contention of the Chapter.

The two versions of this Chapter that I have written, then, both articulate certain realities and erase others. Which to write, then, is a contingent matter. I have produced a pinboard account here because that method is the focus of the thesis. Yet elsewhere the narrative version of this Chapter might be better suited. And elsewhere still it might be appropriate to write them *both* such that the realities

erased by one would enacted by another, thereby together producing synergy between the different accounts. Perhaps, then, narrative and pinboard are complimentary rather than antithetical. On a small scale, this notion is explored in the following Chapter.

Chapter 6

The Pinboard in Practice III:

(Un)ravelling Telemedicine, 1970-1980

This is the third and final case study exploring the pinboard method via the empirical case of early US telemedicine. In this last example, the pinboard is used to produce an account of telemedicine's decline in the mid-1970s. While previous Chapters worked through exhibits to develop their arguments, the pinboard here is constituted by a series of short synthetic accounts which tell of the various ways in which telemedicine was and was not held together in the early 1970s. Hence, this Chapter illustrates an alternative approach to writing a pinboard account and again offers a discussion of the pinboard in its conclusion.

This Chapter is divided into six sections. In the first, a detailed outline of the Chapter is presented which explicates the approach to be taken. In the sections that follow, the Chapter outlines various ways in which telemedicine did and did not hold together. Each section is organised around a theme: telemedicine research and evaluation; the economic aspects of telemedicine; patient and practitioner attitudes towards telemedicine; and finally the issue of interpersonal communication in telemedicine practice. Then, in the final section, a discussion is presented which offers a summary of the accounts produced and a reflexion on the Chapter's use of the pinboard.

The Decline of Early US Telemedicine

While the early 1970s saw a small surge of interest in telemedicine research and practice, by 1975 this had largely dissipated. The telemedicine projects funded by the Health Care Technology Division (HCTD) had ended and their conclusions had been summarised and published (Rockoff, 1975). Other projects, such as those funded by the National Science Foundation, were coming to a close or had already ended. The STARPAHC project, which began later than most others, continued past this point but by 1980 had also come to an end (Bashshur, 1980). The Nebraska television system endured through the 1970s but only for

the purposes of teaching and training (MLM NPI: 1). Hence, by the 1980s, no meaningful telemedicine projects were in action in the US.

In the histories of telemedicine examined in Chapter 3, several explanations for the decline of early telemedicine are constructed. The first of these focuses on technical difficulties: unreliable equipment, insufficient quality of transmission, and so on (e.g. Clark et al., 2010; Ricke and Bartelink, 2000). The second focuses instead on the high cost of establishing and maintaining the necessary technological infrastructure for telemedicine (e.g. Mun and Turner, 1999; Nestor, 2001; Thrall, 2007). And the third focuses on the lack of consistent support and long-term planning of telemedicine research an evaluation (Lovette and Bashshur, 1979). None of these accounts are extensive studies of US telemedicine's decline, however, and as such they are scant on detail and evidence. Bashshur and Shannon (2009: 178-180) are something of an exception, but their account is in fact simply an amalgamation of those three explanations already given with little additional detail or evidence to support the argument.

As a significant but under-examined part of early telemedicine's history, then, the decline of early US telemedicine is taken as the topic of this final pinboard case study. However, the question 'why did early US telemedicine decline?' is inverted here and turned into the question: 'how was early US telemedicine able to hold together for so long?' instead. This inversion mirrors Law's conclusion to *Aircraft Stories* where he writes:

> "If we turn the question ['why did the TSR-2 project go wrong?'] around and ask, rather, how it was that the project managed to hang together for as long as it did, then *the answer cannot be narrated in a single story at all*. Yes, there are stories, many stories about how it held together. Mostly top-down, managerialist stories, stories about control, ordering. I don't doubt that those stories tell us something important. There was plenty of narratable control and ordering. But neither do I doubt that they miss something. They don't, or so I'm arguing, simply miss out because they are incomplete – though no doubt this is always the case. They also miss out because *the project was held together by interferences between the narratives that cannot be properly narrated within those narratives themselves*" (Law, 2002: 202; original emphasis)

The problem that Law addresses, here, is that by answering the question 'why did this project fail?' a narrative outcome – failure – is assumed in advance. In answering that question, then, everything must work towards the final conclusion that the project failed. In contrast, by asking 'how did this project hang together as long as it did?' there is no necessary end point and no implicit narrative structure into which everything must fit. Implicitly, this reprises the classic STS principle of 'symmetry' (see Chapter 1) since the inverted question can be applied

equally to any case (failure or otherwise) thereby rendering all cases analytically equivalent. In other words, it produces the same kind of account regardless of whether the object of study was eventually successful or not. And in doing this, it therefore creates a space for producing a multitude of narratives which, though their partial connectedness, constitute an explanation for whatever outcome ensued.

To explore the ravelling and unravelling of telemedicine, then, this Chapter works through a pinboard of stories and narratives rather than excerpts and exhibits. Its argument is that all these narratives tell something of how telemedicine was held together but that telemedicine's durability – or eventual lack thereof – cannot be reduced to any one of them individually. The chapter therefore illustrates an alternative method of writing a pinboard account and, in the conclusion, offers a reflexive evaluation.

Telemedicine Research and Evaluation

Early Telemedicine Research

Most of the telemedicine systems established in the US in the 1960s and '70s were initiated as research projects designed to examine some aspect or other of telemedicine practice. With a few exceptions, however, those involved in doing telemedicine research were not professional scientists. As a consequence, the time and resources they had for designing and analysing the systems they were using was limited. In Maxine Rockoff's words:

> "[T]hese were not researchers. We're not talking about guys who are in a laboratory experimenting with fruit flies. We're talking about guys who are in the trenches; we're talking about people who are delivering health care under difficult circumstances and we're trying to add some technology, insert some technology into these complicated systems and see if it could make a difference" (Maxine Rockoff, interview)

As a result of this, the evaluation of many early telemedicine systems was done loosely or haphazardly. For example, in their pioneering study on the use of interactive television to deliver group therapy sessions, Wittson et al. (1961: 23) offer a lose anecdotal description of the therapy sessions and their effectiveness:

> "At their first session, most patients showed interest in the technical features of the system. Except for one or two individuals, they expressed little concern over privacy. After the first session, patients in three of the groups seldom referred to the technique

> itself. They began to focus their discussions on the problems typically discussed in short-term groups in this hospital."

In the conclusion of the paper, however, the authors indicate that a more substantial analysis might be forthcoming:

> "We are now engaged in detailed analyses of the group and therapist ratings of televised and nontelevised group therapy sessions. These preliminary analyses indicate that ratings are influenced substantially more by the group members than by the technique" (ibid.: 23)

However, this preliminary analysis is never transformed into a research paper itself. While it is not clear why exactly, lack of both time and the need to publish the results fully seem plausible explanations.

In other cases, lack of methods training was problematic. For example, in Sanborn et al.'s (1973) paper examining attitudes towards television-based medical education, statistical methods are used but applied incorrectly. The data consist of attitude-ratings drawn from two groups of nurses about a lecture course they attended. One group had attended the lectures in-person while the other group had 'attended' via interactive television. In the analysis, the ratings given by one group for each variable are correlated – somehow – with the ratings for the same variable given by the other group. This, however, is an entirely invalid application of correlation and the data call for a comparison of means test instead (thanks to Nick Vivian for confirming this).

Papers published by staff at MGH also make use of quantitative data but the use of appropriate analytical techniques varies. Two papers (Andrus et al., 1975a, 1975b) make use of ROC curves in their analysis to control for variations in the diagnostic patterns of individual physicians taking part in the trial. Others, however (e.g. Murphy et al., 1970, 1972) offer only raw comparisons of the number of 'correct' vs. 'incorrect' diagnoses, or the amount of consistency between mundane and television-mediated practice. Furthermore, none of the MGH papers made use of inferential statistics in spite of the fact that they would have been appropriate in these instances.

In a similar manner, lack of time to organise and implement systems in complex healthcare settings stifled evaluation design. For example, in this discussion regarding the Bethany-Brethren telemedicine project it is explained why the system was not implemented in a manner more suitable for evaluation:

> "C. I was surprised that Bethany was cutting back on the evaluation because it has many systems that balance between technology and situations for which the evaluation would seem just right. I think it would be a matter of available resources to have someone interview or watch them personally. I realize that this may be time consuming and that it may be better to start with a less technical system with pure link and put more into evaluation.
>
> R. Because Bethany is not a research organisation it can't deal with starting with small systems. We presently have a big system and big problems on a daily basis" (NLM 2009-060: 2)

Here one of the project leads for the Bethany-Brethren telemedicine project explains how a smaller-scale system would not work in the context of the Bethany-Brethren hospital complex due to the scale of the issues it faced. In this instance, as in others, the telemedicine system had in fact been installed as much for the sake of resolving actual current problems faced by healthcare institutions as it was for the sake of research and evaluation.

This first account tells of the circumstances under which much telemedicine research was conducted. It indicates, firstly, that early telemedicine projects were mostly established as research or evaluation projects. But secondly, it indicates that there were various circumstances which disrupted the activity of research and evaluation such that in many instances the results were weak and substandard.

On the one hand, then, telemedicine was enacted through research projects which held it together. But on the other hand these enactments were frequently weak and did not produce durable outcomes in the form of solid conclusions about telemedicine. Hence, these research activities only sustained telemedicine in the short-run.

Early Telemedicine Publications

The majority of research publications pertaining to early telemedicine were produced by staff at the NPI, MGH and Dartmouth Medical Centre (DMC) which was home to the INTERACT telemedicine project. These publications are all positive about the practice of telemedicine. A paper by Reba Benschoter (1967: 478), for example, concludes by saying: "I believe that closed-circuit television – especially two-way television – will be a valuable tool in our medical education, service and research". Solow et al. (1971: 1686) similarly conclude that:

> "Further conclusions await further data collection and analysis following the completion of the two-year clinical phase of the project. Experience gained to date, however, seems to justify the conclusion that two-way closed circuit television provides a means of psychiatric interviewing at a distance, in the setting of community medical practice, with a diagnostic and therapeutic effectiveness approximating that which is obtainable in face-to-face interviewing."

While they are all positive, however, the content and purpose of these studies varies considerably. For the most part, the papers produced by staff at the NPI were concerned with illustrating the television system and its use rather than offering an evaluation or analysis of it. Indeed, out of the ten telemedicine publications produced by the NPI, eight (Benschoter, 1967, 1971; Benschoter et al., 1965, 1967; Wittson and Benschoter, 1972; and Wittson and Dutton, 1955, 1956, 1957) constitute a description of the NPI television system while only two (Wittson et al., 1961 and Menolascino and Osborne, 1970) offer some kind of substantial evaluation.

In contrast, the research papers produced by staff at MGH and DMC were primarily concerned with presenting research results instead. The MGH papers focus on comparing telemedicine-mediated diagnoses with diagnoses produced in a regular clinical setting. For example, Murphy et al. (1970) compare in-person interpretations of radiographic slides with television-mediated interpretations. The DMC papers, however, pertain mostly to educational uses of telemedicine instead. For example, Sanborn et al. (1974) report instructors' and students' opinions on the use of television to deliver a 14-week lecture course.

This account here tells of some of the kinds of publications that were produced on the subject of telemedicine through the 1950s, '60s and '70s. On the one hand, it indicates that each of the three main producers of telemedicine publications – NPI, MGH and DMC – had their own specific focus. Papers produced by the NPI were concerned with illustrating their television system; papers produced by the MGH were concerned with demonstrating the effectiveness of diagnosis via television; and papers produced by Dartmouth were concerned with demonstrating the effectiveness of education via television.

On the other hand, however, the account also indicates that in spite of these differences all these telemedicine publications were concerned with demonstrating the feasibility and possible functions of telemedicine rather than offering an evaluation or analysis of it. The NPI publications, by illustrating the Nebraska television system, worked to demonstrate the

plausibility of interactive television as a means of providing education, psychiatric services, research collaboration and more. The DMC papers worked to demonstrate that television could be used as an effective tool in psychiatric training and education and that both staff and students are typically amenable to this kind of system. And the MGH papers worked to demonstrate that television could be used to produce accurate clinical diagnoses. But – and here is the point – none of them considered, for example, whether telemedicine was a cost-effective way of providing these services, whether health or educational outcomes were improved by telemedicine usage and so on.

What these research papers did, therefore, was perform telemedicine as an idea. They did not hold telemedicine together as an effective means of providing health and educational services but instead as a *possibly* effective means of providing such services. In other words, they raised the question of telemedicine, but did not themselves answer it.

Erasing Problems

While the conclusions drawn by early telemedicine publications were positive, problems and difficulties were nevertheless sometimes referred to as well. In such instances, however, these problems were rendered irrelevant either through being explained away or – in some cases – being outright ignored. For example, reporting on the use of interactive television to deliver group psychiatric therapy, Wittson et al. (1961: 23) state that:

> "One television group showed an atypical pattern. This group of five patients included three individuals who, prior to admission, had manifested anti-social and negativistic behaviour. No relationship of trust in the therapist or of willingness to discuss problems with him emerged in this particular group. Instead, the patients utilized the television technique to strengthen their resilience, and, by whispering, managed to exclude the therapist from the discussion for some time."

Implicitly, this event is explained as a result of the group's composition rather than the television system. By highlighting that the group was comprised primarily of 'anti-social and negativistic' patients, the suggestion is that there was a critical mass of problematic patients that allowed them to scupper the session. As such, in the conclusion (which follows just after) there is no reference to this event. Indeed, it is asserted that:

> "It appears that the procedure is technically possible, and would be limited only by the problem of achieving clear video transmission over long distances" (ibid.: 23)

Through indicating that the system would "only be limited by the problem of clear video transmission" the problem concerning group composition is rendered irrelevant or, at least, not a problem of any significance. In a paper reporting on several telemedicine experiments in dermatology at MGH (Murphy et al., 1972) a similar erasure is performed. Out of four trials reported on, three were based upon diagnoses derived from slides of skin lesions rather than live patients. Hence, only the final trial was conducted in a setting equivalent to actual practice. Here is its report:

> "Eight patients with a total of 12 skin lesions were examined independently by the telediagnosis dermatologist using black and white television and by the clinic physician who viewed them directly. With regards to ten lesions, diagnosis was equivalent. Technical factors of lighting and camera positioning prohibited accurate diagnosis in the remaining two cases. Because the television system employed was cumbersome and the time to reach a diagnosis long (average time, 15 minutes), the experiment was terminated" (Murphy et al., 1972: 834)

The excerpt indicates that the trial failed as a result of technical difficulties. Implicitly, this was a catastrophic failure: for all that the system was capable of transmitting images from slides, it had proven incapable of functioning effectively in its intended role dealing with live patients. But while some of the technical difficulties are discussed later, the failure of the experiment is glossed over. Indeed, where the use of slides rather than live patients for the purposes of the experiment is discussed, no implications are drawn at all with regards to the failure of the live experiment:

> "This study can be criticised because slides rather than patients were used for many of the observations. The inherent differences are obvious, but the use of slides allows more standardised conditions than can be obtained clinically. Ability to take medical history and establish rapport with patients has been clearly demonstrated to be feasible by interactive television [elsewhere]" (Murphy et al., 1972: 835)

Little significance is placed on trials with live patients here. Indeed, such trials are rendered only in terms of testing the ability of the physician and patient to communicate with one another effectively rather than the physician's ability to use the television system to examine the patient properly and in good time. Hence, the fact that the trial demonstrated serious problems with using telemedicine to diagnose live patients disappears entirely.

This account tells of how some problems and issues with early telemedicine were rendered both present and absent at the same time. On the one hand, problems were written about

and therefore made manifest in the text. But on the other hand, they were also explained away as atypical, understated or simply ignored. Hence, at the same time as being made manifest they were also erased.

The simultaneous presence and absence of problems with telemedicine worked to support it by mitigating the destabilising effect that these problems might otherwise have had. Furthermore, for a sympathetic reader, the discussion of problems might even have been taken to imply some semblance of balance and even-handedness on the part of the paper's authors, thereby strengthening the credibility of the conclusions drawn.

In contrast, however, to a critical reader these problems delegitimise the conclusions drawn since they highlight not only issues with telemedicine but also imply the author's willingness to explain away or ignore them rather than taking them seriously. Hence, the extent to which these publications hold telemedicine together is contingent on the subject position of the reader. For those who are sympathetic, telemedicine holds; for those who are not, it unravels.

Professional Evaluation

One study of a telemedicine system in Boston (NLM 2009-060: 2) stands apart from other telemedicine research projects undertaken during the early 1970s as a result of its rigour and design. The study was underpinned by the specific aim of examining the value of television compared with the telephone as a means of providing health services (NLM 2009-060: 2). A variety of hypotheses pertaining to the effect of television were established prior to the commencement of the project. The design itself was pseudo-experimental, with the use of either telephone or television randomly selected to support any given patient-case. Data for a number of variables were collected by nurses: the time taken to complete a consultation; the frequency of referrals and requests for lab tests; and so on. Finally, analysis of the data was performed using appropriate statistical methods, although qualitative data was also produced from practitioners.

The results of this study were not favourable for television. Firstly, the study found that nurses handled between 80% and 90% of all cases themselves without the need for consultation at all. Where consultation was required, the television consultations took on average ten minutes longer to complete than telephone consultations due to longer work-up times and waits (NLM 2009-060: 2). The quality of service, according to all measures,

demonstrated no statistically significant differences between the two technologies. And while there were some differences in process, none of those differences were indicative of better care per se. For example, results showed that nurses using television referred patients to the outpatient clinic half as much as with the telephone, but ordered five times as many laboratory tests which in terms of cost more or less balanced out (NLM 2009-060: 2). On the reverse side, the only difference positively in favour of television was that medical practitioners preferred to use it over the telephone. Hence, it was concluded: "These findings suggest that television may have its greatest value in remote sites where the sense of isolation is great and the need to reduce long-distance referrals offsets the costs of the system" (NLM 2009-060: 2).

A few other subsequent studies reported similar conclusions. For example, the Miami telemedicine experiment undertaken between 1974 and 1975 was comprised of two stages, the first of which introduced nurse-clinicians as a substitute for a visiting physician and the second which introduced television as a support mechanism. The results of the experiment (NLM 2009-060: 2) similarly demonstrated that while introducing nurse-clinicians improved care "dramatically", the television system added little to nothing on top of that. Coupled with this were preliminary results from telemedicine trials in Toronto, Canada, which also demonstrated that television offered no significant improvement in care compared with other more simple telecommunications technologies (Conrath et al., 1983).

This account is the inverse of those presented above and tells of the few telemedicine research projects which were carefully designed and subjected to a systematic analysis. Their conclusion: supporting nurse-clinicians via television offered no significant benefit compared with support provided via telephone instead. At the same time, these studies also demonstrated that nurse-clinicians were capable of handling many patient problems themselves. Hence, these studies not only questioned the value of using television to provide healthcare services but also pointed towards possibly superior alternatives.

Hence, while other publications produced positive conclusions about telemedicine, these few raised doubts about it instead. In principle, the conclusions of these few papers need not have been detrimental to the concept of telemedicine since it was specifically *television* which had been rendered questionable rather than telecommunications systems generally. Moreover, as demonstrated by the conclusion of the Boston project's (NLM 2009-060: 2) research report, targeted use of television in specific circumstances was recommended.

However, as demonstrated in Chapter 4, the concept of telemedicine and interactive television were strongly bound together, such that these research studies were disruptive not only to the use of television but the notion of telemedicine more generally.

The Question of Evaluation

The issue of evaluation in telemedicine research was polemic. Studies were designed and undertaken, yet there was no agreed-upon set of principles or methods which came to define telemedicine research. For the most part, evaluation was undertaken loosely and on an ad hoc basis. This is an example taken from a report on one of the HCTD-funded telemedicine projects:

> "The ultimate purpose of this project is to determine whether or not bi-directional video and audio contact between health providers and consumer can be used effectively and efficiently in lieu of personal contact. As a first stage in this determination, the project sought to '... put some communications technology in place in real health care delivery sites to see what would happen...' A more intensive investigation of the specific objectives cited will be conducted in later phases" (NLM 2009-060: 2)

As is evident here, a formal evaluation of the project was put on hold until the system had entered use and been running long enough to "see what would happen". Hence, strategies for evaluation were to emerge after, rather than in advance, of the implementation of the system. This excerpt from a letter written by Maxine Rockoff to telemedicine researchers in 1972 implies that this was a deliberate strategy:

> "For the most part we are doing 'ecological' experiments, i.e. introducing the technology and watching what happens, in contrast to 'laboratory' experiments in which we have replications, matched samples, control situations in which the technology is not introduced, etc." (NLM 2009-060: 2)

In this excerpt, the HCTD-funded telemedicine projects are rendered as open, exploratory projects as opposed to focused, deductive experiments. But while the analysis was not well defined, Rockoff's letter nevertheless contained a long list of points that were to be considered and kept track off as the trials progressed. Rockoff stressed the importance of this at the end of the letter by warning that "[a]ny information we fail to gather as the experiment progresses will be lost".

This open, exploratory and ad hoc approach to evaluation caused controversy with others who were concerned with developing a more structured approach to evaluation. This controversy played out primarily at the telemedicine meetings arranged by Maxine Rockoff around the HCTD-funded projects. Here is an illustration:

> "R. In evaluating the effectiveness of the system, we may determine when the system is successful by (1) looking at how the system is utilized, (2) whether the things the system is being utilized for actually require two-way visual linkage, (3) whether the system was being used consistently in order to produce the best results, and (4) we will look at the impact of the system"
>
> "C. In non-quantitative evaluations there is a tremendous bias to try and to prove that you've done something. On the other hand, in an extremely well organized one you may measure many irrelevancies.
>
> "C. I think you should design a workable system with a null-hypothesis that it won't work" (NLM 2009-060: 2)

This excerpt is taken from a transcript of a discussion regarding the Bethany-Garfield telemedicine project at one of the HCTD project meetings in 1973. In the first paragraph, the project leader outlines how evaluation was being undertaken. Implicitly, it is a kind of case study which aims at examining the system holistically by working through its different elements. In response, it is claimed that this kind of evaluation will be biased and that an experimental design should be adopted instead as an objective test of the system. Ben Park, in a letter to Rashid Bashshur, presents an overview of this conflict:

> "I feel that zealous orthodoxy is right behind a lot of the oversimplification that's been on display at Maxine Rockoff's evaluation workshops: 'Anything can be quantified, and if it can't be, it's suspect,' seems to be the major battle cry, opposed by, 'If physicians say it's valid, who can question it?'" (NLM 2009-060: 1)

Broadly speaking, then, this epistemic controversy reflected more general issues in the epistemology of medical science. The use of statistical methods in medical research had only begun to emerge in the 1950s and '60s and while the use of randomised control trials began to penetrate various fields of medicine in the '60s and '70s, it was far from standard practice (Marks, 1997; 2009). Hence, the kinds of evaluation proposed by physicians drew upon the epistemology of the traditional case-based clinical investigation which had characterised medical research prior to the emergence of statistical practice. In contrast, social scientists and other professional researchers involved in telemedicine research were those advocating the use of statistical methods and comparative experimental designs.

In spite of some attempts to reconcile these two epistemic positions through discussion, no accord was reached. Writing after most of the early telemedicine projects had finished, Park writes in another letter to Bashshur:

> "What the world of telemedicine needs more than anything else, it seems to me, are reliable and workable evaluation methods… You probably recall the inchoate, diffuse discussion that ensued at Maxine's meetings - and to a large extent at your Miami session with Maxine and Tom - where objections to research implications never seemed to become focused. As a result, I had the impression that people like yourself were left frustrated at not being able to identify the nature of the objections and were not able to defend your ideas on mutually-understood ground" (NLM 2009-060: 1)

The question of evaluation, then, remained polemic from start to finish. Although Park (NLM 2009-060: 1) plotted with Bashsur to try and open up the discussion on telemedicine evaluation, the moratorium on telemedicine research was at this point beginning to emerge and there was never another opportunity to raise the issue of telemedicine evaluation during the early period.

This lengthy account tells of the messiness of telemedicine evaluation. A multitude of different approaches, a lack of definite technique and an unresolved controversy over how evaluation should proceed all contributed to this mess. On the one hand, this lack of cohesion resulted in a wide-ranging set of evaluations which all worked differently, making comparisons and general conclusions problematic. While Rockoff's (1975) summary of the HCTD telemedicine projects went some way to ordering this mess, in the end this reduced the conclusions of these projects down to very little.

But on the other hand, the controversy concerning evaluation was one way in which telemedicine research sustained itself, since evaluation was transformed into a question. Two papers presented at the Ann Arbour conference (Elton, 1975; Seibert and Sanborn, 1975) addressed the issue of evaluation while some projects such as the Miami-Dade County project were designed in part to work out ways of evaluating the effectiveness of telemedicine systems (NLM 2009-060: 2). Lovette and Bashshur (1979) exploit this in their attempt to resurrect telemedicine research by pointing towards evaluation as an aspect of telemedicine to be resolved. Thus, while the messiness of telemedicine evaluation proved problematic with regards to the long-term stabilisation of telemedicine practice, it nevertheless worked to sustain telemedicine research and practice in the short term through the controversy that it provoked.

Summary

These accounts tell how research and evaluation both made and unmade telemedicine. On the one hand, telemedicine was performed through research publications which demonstrated it as a plausible and potentially effective means of delivering healthcare services. While issues were raised, these were erased or explained away thereby maintaining telemedicine as a plausible concept. Indeed, the existence of problems and issues – including the issue of evaluation itself – sustained telemedicine practice through their translation into critical research questions.

On other hand, however, there was a lack of methodological cohesion and studies generally lacked a rigorous examination or evaluation of telemedicine. Furthermore, in those few studies which were premised on a more structured methodology, the conclusions drawn suggested that interactive television did not enhance care when compared with other telecommunications technologies. As such, while early telemedicine research worked to perform telemedicine as a possible healthcare practice, it also helped to unravel telemedicine by implying its lack of effectiveness.

Telemedicine, Funding and Politics

Funding Telemedicine Projects

The technology used in early telemedicine systems was expensive. Elton (1975: 256) sums up the issue neatly:

> "Foremost among the economic problems is the high cost of many of the systems envisaged, especially the investment costs. It may be many years before systems come to justify their initial capital outlay. This raises questions of time preferences for costs and benefit, and of investment decisions having to be taken at a national level because of the large sums involved."

Public investment through research grants and special healthcare development funds such as the Regional Medical Program was therefore highly important with regards to the establishment of early telemedicine systems. Indeed, of all the early US telemedicine projects, only the Picturephone system installed at Cook County Hospital in Chicago was entirely self-funded.

Sources of funding varied. The Nebraskan telemedicine system, for example, was funded by an award from the National Institute of Mental Health (Menolascino and Osborne, 1970) but was also supported by state-level funding. The Rural Health Associates telemedicine system was funded by grants from the Office of Economic Opportunity but also received money from the Maine Regional Medical Program and later was awarded a grant from the National Science Foundation as well (NLM 2009-060: 1). Several projects were funded exclusively by the Health Care Technology Division. And so on.

The complexity of telemedicine funding is demonstrated in Table 6.1 which is derived from notes taken by Rashid Bashshur in 1973 about the INTERACT telemedicine system (NLM 2009-060: 1). Funding is drawn from a variety of sources: the Lister Hill National Center for Biomedical Communications, the Veterans Administration, the US Air Force, and a number of miscellaneous grants at both the federal and state level. In addition, some funding was sourced internally and a small amount derived from the actual use of the telemedicine system itself (i.e. fee-for-service payments).

What Table 6.1 also demonstrates, however, is how reliant the system was on external funding. In 1974, internal funding and revenues from the system covered less than 10% of the system's total costs while the estimate for 1977 put the figure only at ~20%. It was accepted, moreover, that the system would never be capable of supporting itself, hence its longevity was entirely reliant on support from research grants and other sources of external funding.

Funding Source	% of costs: 1974	% of costs (est.): 1977
Lister Hill Center	25.2%	10.9%
Veterans Administration	21.4%	10.9%
United States Air Force	14.1%	7.6%
Other Federal Grants	1.6%	6.5%
State Grant	1.7%	18.5%
Internal	5.1%	13.0%
Fee-for-Service	3.9%	8.1%
Other	0.0%	24.5%

Table 6.1: Funding Sources for the INTERACT Telemedicine System, % of Total Costs Covered

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This account tells how early telemedicine systems were financially supported. It indicates that due to high set-up costs as well as the costs of running the system, public investment was more or less mandatory. Obviously, this indicates that telemedicine was held together

by external sources of funding. The significance of this, however, is that telemedicine was rendered contingent on its ability to demonstrate its worth to others. This is meant in two ways. Firstly, individual telemedicine projects only endured for as long as they could secure funding. The HCTD telemedicine experiments, for example, only lasted two years as they were scheduled to be terminated after that point. But secondly, the concept of telemedicine itself required a strong case if new research and evaluation projects were to be established. So external funding was important not only for sustaining individual research projects but also for sustaining telemedicine generally. Hence, telemedicine was only as durable as the arguments and evidence that could be produced to justify it.

Self-Sustaining Telemedicine

Most early telemedicine projects were implemented to support the provision of healthcare services that were already in place. The pioneering telemedicine system implemented by MGH, for example, was used to support services that were already being provided at LAMS. All of the HCTD and NSF telemedicine projects were implemented in a similar manner. Of the exceptions, some were implemented so as to provide health services to impoverished populations. These include both of the NASA telemedicine projects, STARPAHC and the earlier experiment in Alaska which were both used to provide health services to Native Americans in conjunction with the Indian Health Service (Bashshur, 1980; NLM 2009-060: 1). Similarly, Rural Health Associates was established to provide care in a poor, rural area of Maine (NLM 2009-060: 1). Another exception, the Blue Hill-Long Island telemedicine system, was used to provide care to an area with a population which fluctuated heavily as a result of seasonal tourism such that it experienced periods of reduced demand (NLM 2009-060: 2).

The consequence of this is that early telemedicine projects were never implemented in contexts where they were capable of generating much, if any, revenue. In cases where services were already in place, the patient 'market' remained the same size as it was before. In other cases, the poverty and small size of the populations meant that revenues were likely to be small in any case. Accordingly, the capacity for these systems to support themselves financially was very limited. This is demonstrated clearly in Table 6.1 above, where fee-for-service revenue covered for only 3.9% of the total costs of the telemedicine system and even by 1977 was predicted to cover only 8.1%. Tellingly, Bashshur wrote in his notes about those figures: "Do not expect fee-for-service to pay for operational cost" (NLM 2009-060: 1).

This account tells of how early telemedicine systems were implemented in such a way that they were unable to produce revenue and therefore sustain themselves. That this might have been otherwise is not impossible. As demonstrated in Chapter 4, the notion of using telemedicine to access new patient 'markets' and produce competition was not entirely unheard of. But it did not happen in practice. Furthermore, in the context of a more centralised and state-funded healthcare system, lack of revenue production would not have been problematic. Instead, the key question would have been whether the provision of improved healthcare services to underserved populations was worth the increased cost of doing so. Furthermore, a unified healthcare system may have been able to offset some costs of telemedicine through efficiency savings.

But in interaction with the fragmented and decentralised US healthcare system of the 1970s, it was more or less impossible for the telemedicine projects implemented to hold together without external sources of funding. This intersects with the previous account regarding the costs of telemedicine systems and the necessity of external funding. However, it highlights that external funding was important not only because of the cost of telemedicine but because of how early telemedicine systems were designed and implemented.

The Health Care Technology Division

The Health Care Technology Division was established in 1969 as part of the National Center for Health Services Research and Development, itself a part of the Department of Health, Education and Welfare. The HCTD's mandate was to examine potential applications of technology in medicine to alleviate key problems in the US healthcare system. The central concerns, expressed by Rockoff (NLM 2009-060: 2, also in interview; also Norman Weissman, interview), were access, cost and quality of healthcare services. Fully in command of its own budget, the HCTD was entirely autonomous and able to follow up on those projects it considered worthwhile (Norman Weissman, interview).

While ordinarily grants were awarded on the basis of unsolicited research proposals, occasionally a request for applications would be distributed offering funding for research into particular topics. The telemedicine projects funded by the HCTD were a result of one such request. Maxine Rockoff, a project director at the HCTD, had visited Dartmouth Medical School and while there observed the INTERACT television system in action during a lunchtime grand round (Maxine Rockoff, interview). Finding the experience "compelling", she was inspired to write up a research plan for exploring telecommunications as a basis for a

rationally organised healthcare system (NLM 2009-060: 1; see Chapter 4). This was submitted to the HCTD director Bruce Waxman who approved the plan and released funds for support of several telemedicine research projects.

At the same time as funding telemedicine projects, however, the HCTD was also directing funding towards the study of other applications of technology in medicine as well. Indeed, it was the philosophy of the division at the time to spread out funding to try out different "good ideas" and find things which worked (Norman Weissman, interview). Hence, at the same time as funding telemedicine projects the HCTD was funding research related to computing (especially patient record systems), automated laboratory testing, electronic databanks, computerised data mining, and so on. Hence, telemedicine was only a small part of the HCTD's overall activity.

As a consequence of this, telemedicine was implicitly competing for resources with other innovative technologies being funded by the HCTD. Furthermore, while the HCTD had originally been given licence to fund the actual development of new technologies, this ended in 1973 and there was a shift to evaluation projects instead with a heavy emphasis on cost-effectiveness (Norman Weissman, interview). In this context, telemedicine did not fare well. While other innovations, especially patient record systems, could demonstrate cost reduction this was not true of telemedicine (see above). Supporting this, Maxine Rockoff indicated in interview that "having medical record information was more important even than having… two way video". Therefore, with the conclusion of the HCTD-funded projects in the mid-1970s, there was little incentive to invest further in telemedicine research as a result of more promising alternatives.

This account tells of the HCTD's involvement in telemedicine research. It indicates how telemedicine was sustained, for a while, by its promise of a rationally reorganised healthcare system. But it also indicates how telemedicine was in competition with other technological systems as well. Hence, telemedicine's longevity was contingent not only on demonstrations of its effectiveness but on demonstrations of its effectiveness relative to other possible technological applications. Rockoff (NLM 2009-060: 2) explicates this clearly in a letter to telemedicine researchers in which she writes:

> "My concern for evaluation is born of a need to justify this program and this technology to all those planners who make decisions - from each of you as you decide whether to continue paying for it after the government funds run out, to health care system

> administrators who need to choose between television and some new equipment for the laundry, to the decision makers in various government agencies who must allocate scarce resources between competing meritorious programs"

In view of the fact that early telemedicine research had largely produced results which were weak and poorly-substantiated, and also the fact that telemedicine did not demonstrably reduce healthcare costs, it is unsurprising it fared unfavourably compared with alternatives. Hence, telemedicine was only held together for a time by the HCTD that later directed its resources and efforts elsewhere.

The National Science Foundation

Alongside the HCTD, the National Science Foundation (NSF) was an important source of funding for telemedicine research. While it directly funded only two telemedicine projects – one in Boston and one in Miami – it also contributed funding towards the evaluation of the Rural Health Associates telemedicine system and financially supported the telemedicine conferences organised by Rashid Bashshur.

Funding for telemedicine research was acquired primarily via the Research Applied to National Need program (RANN) which was implemented in 1971 to redirect a share of NSF grants to applied rather than basic science (Mata and Sheiding, 2012). Funding for telemedicine was therefore secured through constructing the issue of unequal access to healthcare as a matter of national importance. For example:

> "The broader context of the proposed research relates to problems of rural medical care and to potential avenues for improving or alleviating these problems. The Farmington experience may well provide answers to some of the pressing problems of rural medical care, and lessons learned from it can be applied elsewhere. The problems derive primarily from maldistributions and limitations in medical manpower and facilities usually compounded by lower levels of income and social disparities. Generally, there are fewer public health programs in rural areas, and existing ones usually have a narrow scope. Smaller amounts of public funds have been allocated to rural areas… Perhaps, the stoic and individualistic character of rural people is a basic reason why their problems have not received adequate public attention" (NLM 2009-060: 1)

This quotation is taken from the introduction to a grant proposal submitted to the NSF requesting funds to undertake an evaluation of the Rural Health Associates telemedicine system. It outlines "maldistributions and limitations in medical manpower" as "pressing"

problems of rural healthcare and argues that this was compounded by poverty and the 'stoicism' of rural populations who were unlikely to mobilise around the issue themselves. Hence, healthcare access was enacted as an intractable and serious problem.

Bashshur, who applied to RANN for grants to support telemedicine conferences and publications, was able to secure funding on similar grounds and NSF support was consistent up to the mid-1970s. But the RANN program proved to be politically controversial:

> "[C]riticism abounded. It came from segments of Congress, from other agencies, and particularly from the science community (including the science board and most Foundation staff), which feared that RANN would drain funding from the traditional aspects of basic science" (Mazuzan, 1994)

This criticism began to take its toll when, in 1975, RANN started to wind down its research activities. As a consequence of this, support for telemedicine research at the NSF withered. Bashshur learned this while in the process of attempting to secure funding for a second telemedicine volume based on a conference held in 1975:

> "Concerning your application for publication of a second volume on telemedicine: it appears that there has been some misunderstanding about the prospects for producing an edited volume in the area… [A]t this point the research on telemedicine within the Telecommunications Policy Research Program is being wound down. The only additional work planned for this area is a synthesis and evaluation of work supported by the program, possibly placed in a larger perspective on the general topic of telemedicine research. The proposal which you sent would appear far more appropriate for a commercial publisher than for this program of research support" (NLM 2009-060: 1)

Eventually, RANN was wound down entirely such that in 1978 it was completely disbanded and replaced by a number of smaller research divisions (Mazuzan, 1994). While this new system did not outright reject the possibility of further telemedicine research, it was required to compete with other research activity pertaining to telecommunications more generally (NLM 2009-060: 1). Hence, opportunities for telemedicine research funded by the NSF had diminished considerably by the end of the 1970s.

This account tells of another research funding body, this time the National Science Foundation. While the HCTD had been interested in telemedicine as a means of supporting a rational reorganisation of US healthcare, the NSF was interested in telemedicine more generally as a possible solution to problems of healthcare access and maldistribution of

healthcare resources. But while NSF support for telemedicine was durable through the RANN program, the NSF itself was unstable during the 1970s and when RANN was disbanded it was no longer in a position to support telemedicine projects.

Summary

These accounts tell of the way in which early telemedicine was supported financially. They indicate, firstly, that the expense of telemedicine technology rendered it difficult to establish and maintain without sources of external funding and that this was exacerbated by an inability of telemedicine to produce a meaningful revenue of its own. Early telemedicine, then, was only held together as a result of external funding from research institutions and government-funded healthcare initiatives.

Secondly, these accounts indicate that these external funding sources proved unreliable. In the case of the HCTD, support for telemedicine extended only as far as its initial set of projects after which telemedicine research was abandoned in favour of computing technologies and medical informatics. In the case of the NSF, support for telemedicine was forthcoming but then disrupted as a result of political controversy over the RANN program. If telemedicine failed to hold together in the long run, then, it was because it was unable to maintain itself financially and unable to command consistent support from external sources of funding.

Telemedicine, Patients and Practitioners

Patient Acceptance

One of the first issues that early telemedicine researchers examined was the extent to which patients were willing to accept health services using telemedicine. Researchers were surprised with the results. While it had been expected that patients would be resistant to the idea, in practice patients demonstrated high levels of satisfaction and acceptance. Bird et al. (1971), in their report on the MGH telemedicine system, state for example that almost all patients responded positively to the system. Furthermore, the only patient who expressed a negative opinion said simply that he "missed the hand shake that he thought gave considerable information about the person he was dealing with" (pp. 25). In terms of patient acceptance, however, the STARPAHC project is perhaps most telling. Patients and the Indian Health Service thought so highly of the system that when it began to wind down the Indian

Health Service mobilised (albeit unsuccessfully) to fight for the continuation of the project long-term (Bashshur, 1980).

In a few cases, it was even reported that patients were more responsive and positive towards telemedicine than they were towards in-person care. This was especially the case with regards to psychiatric services, where patients were reported as sometimes being more communicative and open to conversation using television (e.g. Dwyer, 1973). But also, in the context of regular medicine, the head of the Cook County Picturephone experiment Dr. Bush (NLM 2009-060: 2) asserted that patients preferred telemedicine as it gave the impression that the physician's attention is fully focused on the patient.

In spite of all of this, however, patients generally preferred to see a physician in-person where possible. This was particularly apparent in the context of the Blue Hill-Deer Island telemedicine project. As the project was being set-up, an independent physician moved to the area and began providing services on the Island where a satellite clinic had been established. Hence, in the first few months of the project, utilisation of the telemedicine clinic was very low (NLM 2009-060: 2). This, however, was an unusual case. Given that telemedicine systems were implemented primarily in situations where access to healthcare resources was limited, the only alternatives to telemedicine in most instances were for the patient to be seen by a nurse alone, or else to receive no care at all.

This account tells something of how patients responded to telemedicine. Ordinarily they were positive, while in some instances they were in fact more open and responsive using telemedicine than they were in person. Nevertheless, patients on aggregate retained a strong preference for in-person care. On the one hand, then, patients supported telemedicine and held it together through their complicit interaction with telemedicine services and there was more or less no effort involved in enrolling them. On the other hand, however, patients were only complicit in so far as there were no equivalent in-person healthcare resources that could be accessed by the patient. Hence, patients' support was contingent on the deployment of telemedicine in areas without alternative service provision.

Practitioner Resistance

Writing about telemedicine, Bashshur (1975: 16-17) argued that new innovations are frequently met with

> "ready rejection or resistance to the innovation on the part of the majority of people due to inaccurate, incomplete, or total lack of information, little appreciation for what the innovation can do for them, and most important, a mistrust of anything new that might disturb the status quo."

Bashshur's assertion was actualised in many instances with regards to the acceptance of telemedicine by health practitioners. In interview, for example, Jay Sanders told of his own initial reaction to the idea of telemeidicne: "Well, I thought it was the stupidest idea I had ever heard in my life!" Elsewhere, Dwyer (1973: 868) demonstrates physicians' reluctance to engage openly with telemedicine:

> "We have collected observations of a number of professionals who, apparently out of anxiety in their initial encounter of the system, complained loudly that they could not clearly see or hear the person at the other end, while at the same time neglecting to use the simple controls that would have enabled them to bring the patient into focus or turn the volume up."

But while non-acceptance and resistance manifested individually, they also manifested collectively. Physicians and nurses working at the Bethany-Garfield healthcare network found their initial experiences with the system frustrating, exacerbated by delays and technical issues. Park (1974: 71) writes:

> "The consensus went something like, 'With all the things we need around here – including pay rises – why are we spending money on something that doesn't work?'"

Park (1974: 93) also writes of resistance to telemedicine in the context of the Illinois psychiatric telemedicine network:

> "When the Picturephones were finally operational in September, 1973, it became apparent that… planning had not taken into account the attitudes or desires of staff. The staff openly refused to be subjected to questions about their attitudes toward communication with other units and used the system infrequently and in a desultory fashion"

The critical issue in these and other cases centred around the lack of consultation and involvement of staff in planning and decision making as well as a lack of information about the system and its functions. This is indicated clearly in the following excerpt taken from a report on the MGH telemedicine system:

> "The most important negative attitudes seem to rest on the following basis: (1) feelings of not having been consulted enough in the preparatory stages of the planning for

> Teleconsultation. This was met with explanations of why this happened (change of administrative leadership), solicitation of active participation now, and demonstration of how the system could server the objector, (2) a misunderstanding that Teleconsultation was going to be, in a very literal sense, a kind of observational spying on the professional's patient care, (3) apprehension that Teleconsultation would consist in MGH-Harvard 'teaching down' to Bedford, (4) fears that the existence of Teleconsultation would increase workload" (Bird et al., 1971: 34)

In many instances it was possible for this resistance and scepticism to be eroded. After finding that the telemedicine system at Bethany-Garfield was not being used, a series of interviews and discussions were held to consult with staff how best to utilise the Picturephone system (NLM 2009-060: 2). This engagement with staff reduced resistance to the point that, by the conclusion of its funding period, the directors were looking to continue using the system on a permanent basis (Park, 1974). Similarly, in the case of the Illinois telemedicine project referred to above, a detailed study of practitioners' use of time and communication needs was undertaken in order to ensure that the system was deployed in a manner that was effective for them (Park, 1974). As a result, hospital staff began to engage with the telemedicine system more openly.

This account tells of practitioner resistance to telemedicine and how this was overcome through negotiation and engagement. While some opposition to telemedicine constituted a 'knee-jerk' reaction to an unknown technological apparatus, more often resistance resulted from reasoned concerns about its impact on workload as well as misunderstandings about the use of the system. Hence, in many cases, involving practitioners in the planning and implementation of telemedicine systems was sufficient to enrol them and it is notable that in cases where this was done from the start (e.g. the Nebraska telemedicine system) opposition was minimal.

Telemedicine, then, was held together by the cooperation of health practitioners who worked with telemedicine systems but this cooperation was not assured. The enactment of telemedicine, then, was contingent on processes of engagement and interaction with health practitioners so as to communicate the purpose of the system and to ensure that their needs were accommodated.

Subject Positions

The impact of telemedicine varied for different persons involved. For example, what was an improvement for the patient was not necessarily an improvement for the practitioner:

> "[O]ne reason suggested for low utilization of the cable television system in the Lakeview project was that the major benefits accrued to patients, not physicians. Video did not save as much physician travel as had been anticipated because, in retrospect, physician travel had already been reduced to a near minimum by various means, such as having an available partner in the group practice substitute when an emergency arose in the distant town, or by requiring patients to travel. Thus there was little incentive for the physicians to unlearn their accustomed ways of accomplishing a task and suffer through the inefficiencies and frustrations associated with learning to accomplish the task a new (and eventually better) way" (Rockoff, 1975: 29)

Telemedicine systems, then, did not always provide an equal benefit for physician and patient. But the same was sometimes true when comparing the impact of telemedicine on different health practitioners using the same system as well. For example, in his report on the Miami telemedicine project, Hastings (NLM 2009-060: 2) indicates that physicians' and nurses' opinions regarding the telemedicine system were different. Nurses are reported as saying that the television system was slower than using telephone and also that technical issues often caused problems. In contrast, physicians are reported as saying that the system saved time and that technical issues were not much of a problem. The report attributes these differences to the relative roles played by nurses and physicians. For physicians, the television system was a convenience as it removed the need to travel to see complex cases. It was the nurses, however, who were required to deal with most of the technical aspects of the system, thereby exposing them more frequently to problems. Furthermore, as it was the nurses' responsibility to arrange telemedicine consultations and prepare the patient for them, they experienced all of the additional effort involved to make the television system work which was hidden from physicians.

This account tells how experiences of telemedicine differed across different subject positions. While telemedicine brought benefits for some, it also produced costs for others and, accordingly, attitudes towards the systems were variable. Sustaining telemedicine practice, then, was contingent on being able to balance these trade-offs. In practice, however, this

was infrequently done. Rockoff (1975), for example, observes that physicians were seldom reimbursed for their telemedicine work, meaning that they were providing their time for free. Similarly, there were no effective ways to offset the additional workload created for front-end health practitioners who were essentially required to work with telemedicine on top of their regular duties. Accordingly, even where telemedicine systems produced positive outcomes these were not always shared and resistance could persist in spite of them.

Summary

The accounts in this section outline some of the responses to telemedicine and the ways in which these responses were managed. While patients were open to telemedicine, health practitioners were far more variable in their attitudes and commonly required negotiating with in order to generate workable systems. Even then, the effect of telemedicine for different practitioners varied in such a way that sometimes it was difficult if not impossible to produce a balanced solution.

On the one hand, then, telemedicine held together in so far as it was possible to gain the cooperation of patients and practitioners. This was sometimes difficult and required much negotiation, but in the long-run all early telemedicine systems gained the cooperation of health practitioners responsible for running them. But on the other hand, the uneven distribution of the costs and benefits of telemedicine systems meant that it was not always possible to completely mitigate opposition. Hence, while telemedicine was held together by negotiation with and the cooperation of patients and practitioners, this was not always very secure.

Telemedicine and Interpersonal Interaction

Interpersonal Interaction as a Point of Resistance

Thomas Dwyer was Chair of the Department of Psychiatry at MGH in the late 1960s when the telemedicine system there was established. He was utterly against the idea of telemedicine: "[it will] never, ever work… This cold, mechanistic technology will never be able to reproduce the special ambience between the doctor and the patient using this type of technology" (Jay Sanders, interview; also see Dwyer, 1973).

A few years later, in 1973, Dwyer published a paper detailing the telemedicine system established between MGH and nearby Bedford Veterans Administration Hospital. In it, he

reports that his negative prejudice had been completely turned around as a result of using the system. He concludes:

> "The fact that one can have psychiatric transactions over IATV [interactive television] with all of the usual developments… is important and calls for re-examination of some of our fundamental concepts about the nature of a relationship between two people, how it is established and maintained, and what interferes with it. The fact that two or more people can be 'in touch' with each other even though the contact is mediated by electronics invades a questioning of many beliefs that we take for granted. It is too early to say that *nothing* is subtracted from the television interaction as compared with interaction in the same room, but it is certainly clear on the basis of experience thus far that a high degree of personal contact can be made… using IATV" (Dwyer, 1973: 868)

This short account tells of a number of things which cut across those other matters discussed so far in this Chapter. Firstly, it tells again of resistance. While the account Dwyer individually, he was not at all alone in his initial conviction that telemedicine would not work and this is stated in his paper (Dwyer, 1973; also see Park, 1975). Secondly, again, it tells of a way in which such resistance was overcome. Experience using the system was enough, at least for Dwyer, revise understandings of telemedicine and its viability.

Thirdly, it tells how the issue of communication was turned into a question. On the one hand, Dwyer asserts that communication via interactive television is good enough. But on the other hand, he indicates that not enough is yet known about it. This account therefore highlights how telemedicine was stabilised as an effective means of communication but nevertheless also rendered uncertain as the costs of telemedicine relating to communication had yet to be determined.

Frame Tension

> "[Dr. Dwyer] found something which TV directors and movie directors know very well but doctors don't. That's frame tension. And that is that when you are creating the emotions of a scene you not only do it with dialogue and… facial expressions.. but you also do it by the way you shoot the scene. And what Dr. Dwyer found out was when he was doing his mental health examination with a patient if he wanted the patient to realise that what he had just said was very very important… he would start to pan the camera in on his face so over a period of a minute or so while the patient is watching him

> his face is getting bigger and bigger and bigger in the screen and to the patient what the doctor was saying was coming from a much higher authority. And when he wanted to dilute the intensity of the moment… he would pan the camera back and miniaturise himself" (Jay Sanders, interview)

This is another account that tells about Thomas Dwyer and communication via interactive television. It tells of how Dwyer developed a technique for altering the emotional tone of his interaction with the patient. This small part of Dwyer's telemedicine, however, never moved beyond him to become a generalised element of telemedicine practice. It is not documented in any of the published telemedicine literature of the period nor is it described in unpublished documents either. And this is in spite of interest shown towards the issue of interpersonal communication by Bird and others at MGH (see below but also: Bird, 1971; Park, 1975). Hence, this small part of telemedicine practice remained invisible, absent and Other.

A Consultation with Erving Goffman

It was June, 1973. Most of the early telemedicine projects were underway. Maxine Rockoff, a program director at the HCTD, had travelled to New York for a meeting with novice telemedicine researcher Ben Park from the New York Alternative Media Center, eminent sociologist Erving Goffman and his student John Carey. According to Rockoff's subsequent report,

> "[t]he discussion was wide-ranging and stimulating… The meeting began with Mr. Park showing some video tapes of telemedicine interactions to give Dr. Goffman and Mr. Carey some background feeling for what is going on. The reason for the meeting was to find out whether those who study person-to-person communication have something of importance to contribute to our studies which focus, obviously, principally on the medical aspects" (Rockoff, 1973)

In her report, Rockoff notes a number of points that were made during the meeting. Some of these points focus on the ways in which communication via interactive television is different from regular in-person interaction. For example, it was observed that the implicit norms and regulations – the 'code' – for dealing with interruptions or background changes in a face-to-face setting do not work in the context of communication via interactive television. Others raise questions about power and control: what are the roles played by physician and patient in the context of telemedicine; who controls when the consultation is over; and so on.

Others still consider the impact that broadcast television could have on patients' opinions and experiences of telemedicine, with the conclusion that the physician may be able to draw upon some of practices of film-making to "create certain emotions in the patients he is interviewing" (Rockoff, 1973: 3).

In her report to the HCTD, however, Rockoff's conclusion is uncommitted:

> "It is not at all clear just how the expertise of such sociologists can and should be used to develop telecommunications for health care delivery. It was agreed at the end of the meeting that Dr. Goffman would think about this issue and possibly suggest an individual who might be able to visit the various projects that are now going on to elicit the kind of information discussed during the meeting. If the services of such a person came fairly cheaply, I think this would be a very good idea. Also, we discussed the possibility of Dr. Goffman and some of his students taking this on for its intrinsic interest as an academic subject. I believe this may be beneficial in the long run and that it would be possible to get cheap and deep studies this way" (Rockoff, 1973: 4)

Hence, the meeting resulted in the conclusion that while studies of communication via interactive television may be beneficial, they are not valuable enough to be worth spending significant sums on.

This account tells of an attempt to engage with sociologists – Erving Goffman, no less – on the subject of interpersonal communication in telemedicine practice. It also tells of ambivalence. On the one hand, the story demonstrates a productive meeting which generated a number of potentially fruitful research topics and themes. But on the other hand, Rockoff's report lacks a strong conviction that such studies would be worthwhile. They are performed as a luxury – something that would be good to have but ultimately can be done without.

'Blithe Ignorance' of the Issue of Communication

In preparation for the Ann Arbour telemedicine conference in 1973, Ben Park worked upon a paper developing the points raised during the meeting with Erving Goffman and John Carey earlier that year. In a letter sent to Rashid Bashshur, whom Park had become friends with, he outlined the reasons for his interest in communication via telemedicine:

> "I am convinced that the matters I've been working on - the nature of televised interaction, the capabilities of the technology (and physician's unawareness of them),

> the physical properties of television, correlation of needs to communication, and correlation of attitudes to effectiveness - are important and very much interrelated [and need sorting out]…
>
> "[Many people] have failed to recognise factors that I'm looking at and am suggesting can't be ignored. For example, I suggest that there may be a terrific swing in utilization/effectiveness/ efficiency of a telemedicine project relative to the level of participants' understanding of one or all of the matters I'm looking at.
>
> "I've brought this up with a few people now, including some who are formally studying telemedicine. To their credit they have admitted that the correlation never occurred to them but that it seems patently reasonable! In other words, if I'm right, some people with respectable credentials have been prepared to blithely ignore the factor of education/training in fundamentals of televised interaction" (NLM 2009-060: 1)

This account tells of Ben Park's work on interpersonal interaction in the context of telemedicine. For him, the matter of communication was a part of a web of issues which were both highly significant for effective telemedicine practice and more or less ignored by telemedicine researchers and practitioners. Hence, this story tells of a critical weakness in telemedicine research. It is a weakness, moreover, that was never addressed. While Park's paper was published both in his own book on telemedicine (Park, 1974) and also as a chapter in Bashshur et al.'s (1975) collection (i.e. Park, 1975), there is no evidence of it impacting on early telemedicine research or practice. Indeed, the issue of interpersonal communication in the context of telemedicine remains a neglected area of research even today (see Miller 2002, 2003).

Summary

These stories have told of several things. Firstly, they have told how the issue of interpersonal communication was a point of contention and resistance for physicians who refused to engage with telemedicine because they believed it could not be used to communicate with effectively. But secondly, it also tells of how this resistance could be and – in some instances – was over come through experience using telemedicine. Hence, the effectiveness of interactive television as a means of communication and personal experiences of telemedicine in practice were both significant ways in which telemedicine was held together.

Thirdly, the issue of communication in telemedicine was rendered an area of telemedicine research. Yet support for this, as implied by the ambivalence over the use of sociology in telemedicine research and Park's critique of telemedicine research, was at best weak and at worst practically non-existent. And if Park's critique is accepted, then this was problematic in relation to the effective use of telemedicine systems and, by implication, meant that evaluations of telemedicine performed telemedicine less strongly than might otherwise have been the case.

Discussion

There is more that could be added to this pinboard of early telemedicine. Nothing has been told about how the technological apparatus of telemedicine were held together. Nor has anything been told about how those apparatus supported telemedicine practice. Nothing has been told of NASA's involvement in telemedicine research. Nor has anything been told about the politics of central government. Nothing had been told of the meetings and conferences which engendered collaboration between telemedicine researchers. Nor have the passions of those such as Cecil Wittson, Kenneth Bird and other pioneers of telemedicine been explicated. This list could go on but the point is clear enough: there is much which is absent from this account. Again, this is unavoidable: brevity demands a stopping place while an absence of adequate data inhibits the explication of many of these points. So there is reduction.

In spite of this, however, the pinboard presented in this Chapter is sufficient to demonstrate the following conclusion, which is that if early telemedicine held together then it did so only tentatively. In the first section, it was demonstrated that early telemedicine comprised of a series of research projects launched on the promise of equalising access to healthcare resources. But while these projects raised the question of telemedicine, they did little to answer it. Research was haphazard and frequently only a secondary concern for those involved in running the projects. Thus, few studies offered a detailed examination of telemedicine and in those few instances where they did, the results were not much in telemedicine's favour. Similarly, while research and evaluation were themselves opened up as questions, entrenched epistemological differences proved impossible to reconcile.

Similarly, in the second section it was demonstrated that telemedicine was held together by awards provided through research and healthcare development grants. And yet it was unable to hold itself together due to the costs of technology and infrastructure and because systems were implemented in such a way that they could produce very little revenue.

Furthermore, while financial support was forthcoming from the HCTD and NSF, both proved unreliable in the long term due to changing political conditions and the apparent success of other technologies in healthcare organisation.

Again, in the third section it was demonstrated that telemedicine held together through the cooperation of both patients and practitioners who interacted with and used telemedicine systems. Nevertheless, in-person care remained preferential for patients, while the enrolment of staff required in some instances significant negotiation and could not generally produce an outcome which satisfied all equally well.

And then, in the final section, it was demonstrated that telemedicine practice was also held together by small, specialised practices of interaction via television. However, these techniques were never distributed beyond the contexts in which they emerged and, more generally, telemedicine researchers as a whole never engaged in any meaningful way with the communication aspects of telemedicine practice.

By articulating the ways in which telemedicine was held together rather than seeking to explicate why telemedicine failed, the account in this Chapter performs a modest, distributed account of telemedicine. It is modest because it does not highlight key decisive moments or focal points which were definitive of telemedicine's history. While specific events are occasionally described or alluded to (most notably in the narratives relating to the HCTD and NSF), these are downplayed and rendered almost incidental in the narrative. It is distributed as well, however, as telemedicine's holding-together is rendered across a multitude of narratives each of which tell something about telemedicine without telemedicine being reducible to any one of them.

But at the same time as articulating how telemedicine held together, the account also works towards offering an implicit explanation for telemedicine's decline as well. As indicated already, the pinboard presented in this Chapter indicates that if telemedicine held together then it did not do so very well. Hence, over time it eventually unravelled. But this unravelling was also distributed: there was no single moment at which early telemedicine was undone and instead it crumbled one little part at a time. Indeed, such was the subtle pace of this unravelling that it took even telemedicine's most dedicated scholars by surprise. As was his wont, in November 1976 Ben Park wrote to Rashid Bashshur and in his letter asked:

> "Do you have a… scorecard of telemedicine installations? I have a feeling that there is a declining birth rate and a high death rate; as a matter of fact I wouldn't be surprised to hear that births of new TM systems have ceased - for the moment at least. Do you think

> the Democratic Administration will do things that will encourage a renewed interest in TM?" (NLM 2009-060: 2)

At the time of writing, most of the early telemedicine projects in the US had ended, while its most enthusiastic advocates such as Cecil Wittson and Kenneth Bird had long moved on to other things (NLM 2009-060: 2). As Park suspected, no new projects had been funded in the last few years and it had been made clear, at least to Bashshur, that further funding for telemedicine research would not be forthcoming. So it is ironic - but also perhaps very telling - that a man who had been heavily involved in studying telemedicine over the previous 5 years nevertheless could not tell with certainty that US telemedicine research was in fact over.

The use of the pinboard helps building this subtle and distributed account in two ways. Firstly, it gathers into a single space a much wider range of accounts than would be possible in a narrative. This is because it has no need to render the multitude of different accounts in to into a single coherent explanation. It would, for example, be possible to render the first and second sections of this pinboard into a narrative which explicitly links research practice to the withdrawal of research funding. Nevertheless, such a narrative would struggle to integrate those accounts pertaining to interpersonal interaction as they do not link in any direct way to narratives of research and funding. Hence, those narratives pertaining to interpersonal interaction would most likely be erased in favour of a narrative more clearly focused on research and funding.

But this pinboard also helps produce a complex and decentred account by holding these narratives apart. In this Chapter, there is very little comparison or juxtaposition. It outlines a multitude of narratives side-by-side but does not tell how they can or should be related to one another. Sometimes relations can develop implicitly. A case in point here is the account of the HCTD which overlaps more or less neatly with the accounts of telemedicine research. But at other times, they do not overlap or interrupt one another. For example, the account of patient acceptance barely interacts with any of the other accounts at all. In contrast, the accounts pertaining to telemedicine research do interact each other but do so in a way that interrupts rather than coheres. One account describes how telemedicine research was haphazard and amateurish, while another describes telemedicine research as professional. A further account describes the positive conclusions drawn in research publications while yet another highlights the unfavourable results from trials with television. And so on.

The consequence of this is that the pinboard remains an open space. It was indicated above that more narratives could be added to this account and this is true, not only because there is

more to write but because the account remains open to new additions which can be placed alongside those which already exist. Accordingly – in principle at least – there is no limit to the scale and complexity of an account that could be produced by this method.

For all this, though, the account loses certainty. This is obvious, but it is important both practically and conceptually. Practically, the ambivalence and uncertainty of the account makes it less powerful than a narrative which points to clear, cohesive chains of events. It is also harder to follow, because there is no single strand or line of argument which ties the various accounts in the Chapter together. But it is a conceptual matter as well, because by refusing to draw links between the different narratives, *order and cohesion are being erased*. So the pinboard, too, is engaged in reduction, an argument that will be picked up again in the final Chapter.

Chapter 7

Conclusion

This is the final Chapter. It is a summary, a discussion and a conclusion of the work presented in this thesis. It is divided into three sections. The first presents a general overview of the thesis so as to recapitulate the overall argument. The second then offers a discussion of how the pinboard method was translated from principle into practice in Chapters 3-6 and offers a conclusion as to the implementation of the pinboard in social science research. Then, in the final section, the Chapter presents an evaluation of the pinboard's ability to know complexity and work against reduction.

The Pinboard in Practice: An Overview

Drawing from arguments developed by both Law (2004) and Savage and Burrows (2007), it is argued in the Introduction that methodological innovation is – or should be – a critical concern of 21st century sociology. In part this is a practical issue. If Savage and Burrows's argument is followed then sociology is at risk of redundancy if it cannot produce new methods and therefore re-establish itself at the forefront of empirical social research. But it is also an epistemological issue. If Law's argument is followed, then existing methods of social research are incapable of knowing certain kinds of realities and therefore there is a need for new tools in social science research. Most importantly, however, it is a political issue. Savage and Burrows frame their call for innovation in terms of resistance, arguing that new methods will in turn produce a new critical sociology capable of challenging the everyday knowledge-producing practices of 'knowing capitalism' (Thrift, 2005). Law, on the other hand, argues that knowledge-making practices constitute and reconstitute realities, the implication being that realities not enacted by knowledge-producing practices are rendered insignificant and invisible and are therefore erased.

Hence, in view of these arguments, the thesis works to present both an illustration and evaluation of John Law's (2002) pinboard method. In Chapter 1, the pinboard is outlined as a manifestation of post-Actor-Network Theory: a version of Science and Technology Studies

concerned especially with examining the ways in which realities are brought into being and are held together. Premised upon an anti-foundationalist, semiotic ontology, post-ANT conceives of realities as 'fractionally coherent', that is, as comprised of a multitude of different enactments which are nevertheless rendered singular and cohesive through practice. Following Law (2002; 2004), conventional methods of social science tend to erase this fractional coherence of reality as they are premised upon the assumption that reality is instead singular. Hence, the pinboard is a method of articulating and performing these fractionally coherent realities which are otherwise invisible to social science. Nevertheless, it is a method which has been more or less entirely overlooked even within post-ANT scholarship let alone social science more generally and it is therefore in need of close examination.

In Chapter 2, an analytical strategy for exploring the pinboard method is outlined based upon a brief examination of two other examples of methodological innovation: Grounded Theory (Glaser and Strauss, 1967) and Qualitative Comparative Analysis (Ragin, 1987). This strategy is comprised of three elements – exemplification, comparison and critical reflection – and it is these three elements which structure the remainder of the thesis. The first element – exemplification – is performed through a series of case studies of early US telemedicine demonstrating the pinboard method in practice. The second element – comparison – is performed by drawing upon the multitude of accounts of early US telemedicine which already exist and deploying them as a point of comparison against the pinboards presented in Chapters 4-6. Comparisons are also drawn between previous drafts of empirical chapters as they had been written in a conventional format. And finally, the third element – critical reflexion – is performed throughout the thesis in the form of reflexive asides.

The following Chapters 3-6 are all dedicated to the explication of the pinboard in practice. The first of those, Chapter 3, presents an overview of existing histories of telemedicine through a pinboard account. As well as demonstrating the heterogeneity of those histories, it also demonstrates how they worked through narrative to perform versions of telemedicine in the present and future as well. This Chapter also works as an introduction to the pinboard method in practice, using reflexion to highlight some of the problems and difficulties with its initial implementation.

Chapter 4 then moves to produce a descriptive account of early telemedicine using primary data. Beginning with a contemporary account of a 'typical' telemedicine system, the Chapter then proceeds to develop a pinboard detailing different enactments of early telemedicine technology, applications and organisational forms. These various enactments of early

telemedicine are juxtaposed with one another and with the 'typical' account that outlined at the start. In reviewing this pinboard at the end of the Chapter, the conclusion drawn is that the pinboard adds little in terms of content compared with the totality of other accounts outlined in Chapter 3. Nevertheless, it effectively accentuates the differences between the various enactments of telemedicine presented in the exhibits. In doing so, it works to displace the individual telemedicine project as the centre-point of analysis and produces a decentred description which runs against the 'typical' version of telemedicine as a technology for organising healthcare into a hierarchical system.

Following this, Chapter 5 narrows its focus to a single example of early US telemedicine in Nebraska. Here, two interlinked pinboards are produced, one concerned with the Nebraska Psychiatric Institute's CCTV system and the other concerned with the concurrent politics of mental healthcare in Nebraska. By articulating the connections between these two pinboards, it is argued that the politics of mental healthcare – especially the community mental healthcare movement – constituted the taken-for-granted backdrop ('hinterland') upon which support for the NPI CCTV system was premised. Hence, the NPI CCTV system is argued to have been both a means of enacting CMH in Nebraska but also, in turn, an enactment of CMH itself. In conclusion of that Chapter, then, it is argued that the pinboard produces a complex, decentred account of the NPI CCTV system through its distribution across CMH. This contrasts with the simple causal arguments developed by Bashshur and Shannon (2009) to 'explain' the emergence of telemedicine in the US.

Finally, in Chapter 6, focus is widened again to consider the issue of early telemedicine's decline in the mid-1970s. Rather than asking this question specifically, however, it is inverted to ask instead how it was that telemedicine held together for as long as it did. In answering this question, a pinboard of short narratives is presented, all of which tell something of how telemedicine was held together. In producing this modest and distributed account of telemedicine, the conclusion reached is that telemedicine was only ever held together loosely and its failure was not characterised by a single decision or a chain of important events but instead constituted a slow, distributed unravelling.

So that is the thesis, summarised. By way of conclusion, then, here is a final set of discussions concerned with evaluating the pinboard method. The first outlines how the pinboard was translated from a set of principles to actual practice, arguing that the pinboard can be conceptualised as a method of constant contrast. Following this, the second discussion presents a conceptual outline of the pinboard and the consequences of its use.

From Principle to Practice: Enacting the Pinboard Method

In the final section of Chapter 1, the pinboard is rendered as a set of basic principles derived from the scant literature that pertains to it. The first is that a pinboard account works through the presentation and discussion of a number of points of interest relevant to the topic. The second is that a pinboard account juxtaposes these points of interest with one another in such a way that it does not attempt to render any of those points of interest more important, true, real or general than the others. And the third principle is that the production of a pinboard account is premised upon the use of an actual pinboard or equivalent space as a tool for exploring and accentuating the differences between relevant points of interest.

In each of the Chapters 3, 4, 5 and 6 these principles are used to produce an analysis of early telemedicine or, in the case of Chapter 3, its histories. Put into practice, these principles functioned as a set of guidelines rather than as a precise set of rules and as such there remained much room for manoeuvre. The consequence of this is that it was possible to explore different ways of producing pinboard accounts and this is reflected in the differences between the four pinboard Chapters.

In Chapter 3, the pinboard method is used to produce an account of existing histories of early telemedicine. Its points of interest comprise of a series of exhibits drawn from those histories and which illustrate various ways in which early telemedicine is performed by them. One section presents ways in which those histories are structured. Another section illustrates a variety of different enactments of telemedicine performed through those histories. And a further section outlines a multitude of narratives which those histories construct.

The organisation of Chapter 3 rubs against the second principle of the pinboard outlined in Chapter 1 as this organisation constitutes an implicit hierarchy. By organising specific enactments of telemedicine into overarching categories (e.g. the origins of early telemedicine) the flat analytical space demanded by the second principle is disrupted. Nevertheless, it is not apparent that this structure is in fact problematic. The emphasis of the discussion is focused on the exhibits rather than their categorisation, hence the stratified space produced by Chapter's organisation is not reified. On a practical level, the organisation of the Chapter also makes it easier to follow and to draw attention to specific similarities and differences between the exhibits. So while the Chapter enacts some small amount of ordering and therefore produces a less-than-flat space, overall this does not disrupt the pinboard account to any significant degree and, in fact, helps support it.

The account in Chapter 4 bares a close resemblance to the account in Chapters 3. Again, its points of interest are presented as exhibits though this time pertaining directly to early US telemedicine rather than its histories. And again, these exhibits are organised into discrete categories concerned with the technology, the applications and the structure of early telemedicine systems. In addition to this, however, the Chapter also presents an overview of what was a 'typical' conceptualisation of telemedicine in the early 1970s. Unlike the rest of the Chapter, this account rendered technological, functional and organisational enactments of telemedicine together into a single, fractionally coherent version of it.

Accordingly, Chapter 4 implicitly demonstrates two different ways in which telemedicine can be rendered. On the one hand, it demonstrates a disaggregated rendering – that produced in the main part of the Chapter – in which technological, functional and organisational versions of telemedicine are enacted. In this rendering, the exhibited enactments of telemedicine are separated from their contexts, that is, from those other enactments of telemedicine that they were originally performed together with. On the other hand, however, in that first section outlining a 'typical' version of early telemedicine, an aggregated version of telemedicine is performed instead. In this instance, rather than contrasting different enactments on the basis of a common theme (technology, application, organisation or whatever) they are instead contrasted in relation to the overarching version of telemedicine that they were constitutive of. The point to be made here, then, is that even if the structure of a pinboard account does not reify the particular categories or concepts that are used to organise it, then this structure is nevertheless impactful in terms of the realities which are brought into the account and how they are related to one another. Hence, the structuring of a pinboard account cannot be taken for granted or ignored as unimportant.

In contrast to Chapters 3 and 4, the principles of the pinboard method are deployed quite differently in Chapter 5 as a result of its twin focus on telemedicine and the politics of mental healthcare in Nebraska. Hence, as well as describing each of these through a pinboard, the Chapter works to explicate the ways in which the two were entwined with one another. Hence, it performs two different pinboards – one centred on CCTV at the NPI and the other centred on CMH in Nebraska – but also works them into a single hybrid account of telemedicine-in-context.

The production of this hybrid account constitutes an inversion of the second principle of the pinboard. The second principle mandates that a pinboard account should present and discuss points of interest on a flat surface where none are rendered more significant or real than others. In the analysis presented in Chapter 5, however, that flat surface was the

outcome of analysis rather than its starting point since the equivalence between the NPI CCTV system and CMH was precisely what was at stake in the argument. Hence, only through demonstrating how the two were entwined, that is, through demonstrating both that the CCTV system was premised on CMH but also that CMH was enacted through the NPI CCTV system, could the various enactments of both be performed as part of the same flat space. Again, then, there is ordering. But in contrast to the previous two Chapters it is ordering that works towards the production of a flat topographical space rather than away from one.

The final case study in Chapter 6 is the most distinct of the four pinboard Chapters by virtue of its deployment of short narratives instead of exhibits as its points of interest. But it is also distinct because these narratives carry much of the weight of the Chapter. While Chapters 3-5 are held together by discussion of exhibits, Chapter 6 presented its multitude of narratives without attempting to tie them together with one another. While short summations of each of the narratives are presented along with some overall summaries at the end of each sections, the narratives mostly stand independent of one another.

As a consequence of this, it can be asserted that Chapter 6 is the most literal of the four pinboard accounts. Indeed, the structure of Chapter 6 is not at all dissimilar to the pinboard-space worked through in deployment of the third principle (although see below): it presents the accounts on a flat surface and leaves room for them to be shifted around by refusing any definite ordering of their relationships or interactions. On the one hand, then, its ambivalence works to retain the complexity of early telemedicine by refusing to reduce the accounts to a definite set of relationships and interruptions. Yet, as will be demonstrated in the following section below, its lack of definite cohesion also makes it uncomfortable and difficult to follow.

The four case studies, then, deploy the principles outlined in Chapter 1 in different ways. In Chapters 3 and 4, the analysis is presented through exhibits of early telemedicine and its histories so as to produce a broad, decentred, descriptive overview. Juxtaposition of these exhibits throughout the discussion carries the reader through the account. In Chapter 5, the analysis again works through exhibits but this time to produce a focused description of the NPI CCTV system. But in doing so, the flat topology that constitutes the starting place of analysis in Chapters 3 and 4 is rendered the product of analysis in Chapter 5, thereby transforming the account into a kind of explanation of the NPI CCTV system by integrating it with the hinterland of CMH. And finally, in Chapter 6, another kind of explanatory account is presented which this time works through an array of short narratives to produce a decentred and distributed account of early telemedicine.

But more can be said. While the discussion above indicates how the first and second principles of the pinboard are deployed throughout the thesis, there is no discussion of the third. The reason for this is that, in practice, it contributed very little to the accounts which were produced. In constructing the first pinboard account in Chapter 3, the approach did in fact prove to be manageable. As described in the box '*More on Method*' (Chapter 3: 82-83), the texts were read through, coded and arranged in a pinboard which was simultaneously constructed as a list. In this instance, the volume of data was sufficiently small that it was possible to work off of the list rather than the pinboard of actual papers that gradually spread across the floor.

However, when producing Chapter 4 this system broke down. The physical space required was prohibitive and it was also difficult to access the relevant parts when attempting to write up the account. The manner in which the data had been assembled and stored originally was also problematic. The resources being used were primarily notes rather than original material as often the original copies were no longer unavailable (i.e. much of the material used from the National Library of Medicine; see Chapter 2). In these notes, multiple points were frequently run together which made disaggregating and redistributing them on the emergent pinboard problematic. Moreover, even had this not have been an issue, to work with original copies of the data would have only exacerbated the issue of physical space.

But if using a pinboard-like space for data analysis was a practical problem, then it also proved problematic with regards to writing the emergent account. While the technique provided a starting place for analysis, as the data were rendered into a written account things frequently did not work as anticipated. Something would be missing, or be superfluous, or a rereading of a quote would result in a reassessment of the point being made and so on. In other words, the analytical work went on even as the Chapters were being written. Hence, given how cumbersome it was to work using the technique, it was abandoned for the final two Chapters.

That it was possible to abandon the third principle entirely is indicative of the fact that most of the analytic work done to produce the accounts in Chapters 3-6 was grounded in what amounted to standard practices of qualitative data analysis. As indicated in the box '*On Coding and the Pinboard Method*' (Chapter 4: 150-152), analysis for the original draft of Chapter 4 was based upon coding and recoding the data in constant comparison to produce a small number of conceptual categories. But in reworking this Chapter into a pinboard account, the move made was simply to return to the initial, less refined analysis which had been produced through the first stage of analysis. And by returning to this disaggregated

array of themes and concepts, the analysis then continued by juxtaposing and contrasting them with one another rather than comparing them and linking them together.

In conclusion, then, the analytical practice of the pinboard might be described as a process of constant *contrast*. While the conventional practices of qualitative data analysis work by drawing and redrawing comparisons between themes and cases so as to produce ever-larger conceptual categories (Bryman, 2012; Schutt, 2012) the pinboard works through an iterative process of contrasts and juxtapositions instead. It is therefore the inversion of constant comparison, working to multiply realities through accentuating their differences rather than working to reduce realities by subsuming their differences within broad conceptual schema.

Through this notion of constant contrast the three principles of the pinboard outlined at the end of Chapter 1 are rendered redundant. The first principle – presenting the account through points of interest – is implied by the necessity to communicate in a text the multitude of different realities produced through the analysis. The second principle – contrast upon a flat surface – is more or less the basic principle of a process of constant contrast in any case. And the third, as already indicated, proved in practice to be unimportant with regards to analysis in any case. Accordingly, the notion of constant contrast can replace these principles as the central component of the pinboard method.

(Ir)reduction: the Pinboard as a Method of Knowing Complexity

It was asserted in the Introduction that while narrative draws things together to produce smooth, ordered, cohesive accounts of reality, the pinboard works instead through juxtaposition and pastiche to emphasise contrasts and differences between different realities instead. In so doing, the pinboard refuses reduction so as to articulate and enact complex, heterogeneous and non-coherent realities which are erased by the standard practices of social science. The illustrations of the pinboard presented in Chapters 3-6 offer a demonstration of this in practice and the discussion just above has outlined the ways in which a pinboard might be produced in practice. In doing this, the notion of 'constant contrast' is constructed as the core analytic strategy of the pinboard method. What remains to be demonstrated, however, is the extent to which the pinboard in fact makes good on its promise to articulate and enact complexity and refuse reduction.

Working through the four Chapters, it can be argued that each works to produce an account of complexity. Through the pinboard in Chapter 3, existing histories of telemedicine were performed as heterogeneous in a number of ways. Considering their structure, it was demonstrated how they work through both descriptions of individual cases as well as general

summations to make their arguments. Considering their enactments of telemedicine, it was demonstrated that accounts of telemedicine's origins and of the effectiveness of early telemedicine varied considerably and that although performances of telemedicine as a technology were ubiquitous, there was nevertheless variation in how this was done. Similarly, the pinboard demonstrated how accounts of early telemedicine perform a variety of different narratives tying early telemedicine into the present and future.

In all these ways, then, histories of telemedicine were multiplied through an explication of the many differences between them. By way of comparison, here is an excerpt from a very old draft of the same Chapter:

> "As is apparent from the above overview, in spite of there being a large number of different accounts, a great many are very similar in their scope and approach and are largely deployed as context for a broader account or argument. Only a small portion of early telemedicine work is considered by the existing corpus of literature and typically there is a scarcity of detail. Furthermore, accounts are focused on telemedicine primarily as a technology and the development of telemedicine is underpinned by a linear and progressive model of technological development (although often this is implicit) [etc.]"

Rather than explicating the many differences between histories of telemedicine, it is apparent from this excerpt that the old review it is taken from worked instead to reduce the differences between the accounts and therefore render those histories of telemedicine more or less equivalent with one another. This is not to say that the review made no distinctions whatsoever. For example, a contrast was drawn between the shorter accounts and the two extensive ones (i.e. Bashshur and Shannon, 2009 and Park, 1974). Nevertheless, the explication of differences was minimal by comparison with what has actually been presented in the final version of Chapter 3. Hence, at least when compared to this old, standard rendering of the same literature, it can be concluded that the pinboard presented in Chapter 3 produces a more thorough articulation of that literature's complexity.

Similar in structure to Chapter 3, the pinboard in Chapter 4 articulated a range of different enactments of early US telemedicine. Opening first with an explication of a contemporary account of 'typical' telemedicine practice, the pinboard then proceeded to develop in juxtaposition to this 'typical' version of telemedicine by outlining enactments of telemedicine technologies, applications, and organisational structures. In contrast to the 'typical' account of telemedicine which emphasised television technology, the pinboard demonstrated how a wide range of different technologies were used in early telemedicine and that even the

Reflexions: *Modest Methods; Further Research*

In Chapter 2, a case was made for the production of 'modest' accounts of method which explicate research practices in detail so as to demonstrate the local validity of knowledge claims made in social science research. Acting upon this, Chapter 2 outlined the processes by which this thesis was constructed and in doing so pointed towards a variety of problems with the thesis related to design, data production and so on. To complete this account of modest method, I want here to briefly outline two further issues – both of which relate to aspects of the research design which have elsewhere been lauded as strengths – and suggest how they might be resolved in future research.

Firstly is the issue of comparison. Comparison was established as a key part of the analytic strategy for methodological research developed in Chapter 2. This rendered early US telemedicine a powerful case for exploring the pinboard method as a result of the abundance of histories of early US telemedicine which could be drawn upon for the purposes of comparison.

In practice, however, these histories have proven problematic and for two reasons. Firstly, many of the accounts are very short. Drawing a comparison between those accounts the accounts developed in this thesis, then, is problematic because their scales are not comparable. This was an issue in Chapter 6, for example, as none of the existing explanations for telemedicine's decline have been developed in detail and therefore the pinboard presented in that Chapter was more or less by default a more complex account. But secondly, the few more extensive histories of telemedicine are also problematic because they cannot be adequately presented in the text. This was an issue in Chapter 5, for example, where it was impossible to articulate Bashshur and Shannon's explanation for the emergence of telemedicine more thoroughly so as to more clearly accentuate the distinctions between it and the pinboard account developed in the Chapter.

Drawing from the box '*Multiple Accounts*' (Chapter 5: 177-179), a possible solution to this problem would be to produce both a conventional and pinboard account simultaneously in the same text. By doing so, the accounts would be comparable in terms of their scope and the resources used to produce them, with the result that

differences between the two kinds of account would be more clearly associated with the methods used to produce them. This kind of experimentally-inspired design has precedent in, for example, in Mol and Mesman's (1996) paper comparing a symbolic interactionist account of neonatal food on an intensive care ward with a semiotic account of the same case. In doing this, Mol and Mesman are able to illustrate the different kinds of politics that each of the two approaches perform and, accordingly, demonstrate an effective method by which the pinboard might be contrasted more clearly with conventional methods of social research.

The second issue relates to the case of telemedicine. One of the reasons why telemedicine was described as a useful case for studying the pinboard is that there are many aspects of it which are analogous to the case of the TSR-2 aircraft that Law (2002) uses to develop the notion of the pinboard. However, this similarity is also problematic as it means that the thesis does not demonstrate how the pinboard method might work with regards to cases substantially different to the one Law uses to develop it. The argument might legitimately be made, then, that while this thesis demonstrates the pinboard as a method for articulating complexity in the case of a historical study of a socio-technical system, it does not demonstrate its applicability to more conventional sociological issues.

Hence, a further study of the pinboard method would be best undertaken using a case or topic that is more in-fitting with mainstream sociological research. Not only would this offer a test of the pinboard method in a different setting but it may also make the study generaly more interesting to those (many!) sociologists who have little interest in science and technology.

use of television itself was not singular. Similarly, while the account of 'typical' telemedicine practice performed telemedicine as means of providing clinical services to patients, the pinbaord in Chapter 4 demonstrated how telemedicine was enacted also as a tool for education, research, administrative work and general communication. And, finally, while 'typical' telemedicine was enacted as a hierarchically organised healthcare system, in practice several telemedicine projects utilised a more distributed organisational form.

But while the pinboard in Chapter 4 explicates telemedicine in a more diverse and complex manner than the contemporary account of 'typical' telemedicine presented at the start of the

Chapter, things are less straightforward when comparing the account to recent histories of telemedicine. On the one hand, the account in Chapter 4 articulates more thoroughly the complexity of early US telemedicine than any of those histories taken individually as the range of enactments performed through its pinboard is much greater. However, *in sum* those histories perform early telemedicine in a manner that is much more comparable. Together, they articulate a number of different telemedicine systems carrying out a variety of different functions. Through describing different origins of telemedicine and producing different accounts of its discontinuation, a multitude of different telemedicines are performed. And so on.

The point, then, is that as a result of their heterogeneity the histories of early telemedicine outlined in Chapter 3 *together* constitute an articulation of the complexity of early US telemedicine. It was for this reason that the pinboard presented in Chapter 4 was concluded to have added little in terms of content when compared with existing literature. It did not, in other words, articulate any particular enactments of telemedicine which could not have been known by reading the existing collection of accounts related to early telemedicine.

What the pinboard did instead, then, was produce a shift in emphasis. While existing histories of telemedicine articulate in sum a multitude of different enactments of early telemedicine, the differences between these enactments are never emphasised. Even where differences exist in the same text, these are typically erased through summation and conclusion (see Chapter 3). In contrast, the pinboard in Chapter 4 rendered the differences between alternate enactments of telemedicine central, thereby emphasising the heterogeneity and complexity of early US telemedicine which is otherwise understated or only implicit in the totality of other accounts.

What is demonstrated in this discussion is that there are in fact two moves made when producing a pinboard account. The first, which has already been encapsulated in the notion of constant contrast above, is that it works through juxtaposition to articulate heterogeneous, non-coherent and complex realities. But to do this, it simultaneously draws together those heterogeneous, non-coherent and complex realities into a single analytic space. This is the point which has been implicitly made by the conclusion in Chapter 4. It indicates that the pinboard has gathered together a multitude of enactments of early telemedicine which, yes, are performed elsewhere but not at the same time or together in the same space. And it is only through drawing these enactments together that the account can juxtapose them with one another and put their differences into relief.

This drawing together that is performed by the pinboard is demonstrated even more clearly in Chapter 5, for it is by gathering together both the NPI CCTV system and its otherwise absent hinterland – community mental healthcare – that a complex account of Nebraskan telemedicine is produced. Indeed, while this Chapter articulates different versions of Nebraskan telemedicine – as a range of teaching practices, as a means of providing better psychiatric care, as a means of lowering state expenditure, and so on – it is this gathering of telemedicine and CMH which is critical to the analysis.

Chapter 6 similarly demonstrates how the pinboard gathers together, though again in a different manner to the previous Chapters. Here, it is not different enactments of telemedicine that are gathered together but instead different narratives. Any of the accounts presented in Chapter 6 could stand alone and some could be rendered together into an effective narrative account of early telemedicine's emergence and subsequent decline. However, as was argued in the Chapter's conclusion, rendering the multitude of accounts that are presented in that pinboard together into a single coherent narrative would not be possible. Hence, the pinboard in Chapter 6 produces a complex, multi-faceted account of telemedicine's holding-together by bringing together a multitude of narratives which ordinarily would not exist in the same space.

So on the basis of the case studies presented in this thesis, it can be concluded that the pinboard method does indeed produce accounts which articulate the complexities of heterogeneous and non-coherent realities. It can also be concluded that this is done through gathering those realities together into a single analytic space and juxtaposing them with one another to highlight their differences.

But here is the issue: for all that the pinboard produces accounts of complexity, it nevertheless cannot escape practices of reduction. There are both practical and conceptual reasons for this. Practically speaking, a point that has been made several times throughout the thesis is that there is insufficient space to develop accounts in full. In Chapter 4, further enactments of telemedicine (for example, related to telemedicine research) could not be included as there was not the space to develop them. Similarly, in Chapter 6 a large number of further narratives could have been written to enlarge the pinboard presented but in the end it was necessary to exclude them.

Data too has been an issue. For example, reference is made in documentation to extensive discussions between Cecil Wittson and state representatives in 1951 as he made his case for the NPI. However, there is no documentation detailing these discussions and therefore no

ability to explore the ways in which CMH was performed in that setting. Hence, in both ways there is erasure and therefore reduction.

The format of the text itself has also inhibited the production of a pinboard accounts. For all that Chapters 3-5 eschew narrative, they are nevertheless rendered smooth by the linear discussion that ties points of interest together. A discussion of one exhibit leads to discussion of another such that the account flows from one point to the next more or less seamlessly. Thus, even while these accounts enact difference and complexity they do so in an ordered and cohesive fashion. Integrating points of interest which disrupt this flow or drawing contrasts between two distantly located points of interest can therefore be difficult and lead to the erasure of those enactments which cannot be as easily integrated into the text. More or less the entirety of Chapter 4 is an example of this. While any enactments of telemedicine could have been articulated in that Chapter, the technologies, applications and organisational structures of telemedicine were chosen not least because these enactments meshed with the 'typical' version of telemedicine presented at the Chapter's outset.

The organisation of Chapter 6 was in part an attempt to resolve this problem. As outlined above, in Chapter 6 there was very little discussion which linked the different narratives together. Yet this structure created its own problems. Here is a remark that was made by a commentator who reviewed the Chapter:

> "I found this chapter more tricky than the other ones, and I wonder if that is because there are so many strands to illustrate and corroborate your argument. In retrospect I think it helps to show how multifaceted the picture is, but mid-way through the chapter I was worrying that I was not remembering or holding the argument" (Jen Wingate, personal communication)

This remark indicates how the commentator had found it difficult to follow the argument in the Chapter. On the basis of this, she suggested that there be some greater explication of how things tie together so as to make it easier to follow. To do this, though, would be to undermine the distributed structure of the Chapter by gathering its multitude of strands together into a single account, precisely what the Chapter attempts to avoid!

To be clear, the point is not to suggest that the comment misunderstands the purpose of the Chapter but instead to suggest that the expectation of a coherent argument is borne out of the Chapter's linear structure. The succession of narratives, one after the other, implies a connection between them even if that is not what is intended. Hence, while the linear

structure of the text invites the writer to produce ordered and cohesive accounts, then so too does it invite the expectation of cohesion from the reader as well.

The implication that can be drawn from this is that to articulate and perform complex and non-coherent realities requires not only a different mode of analysis to the traditional practices of social science but also a different mode of presentation and dissemination. Complementing the recent turn towards digital data collection and analysis (e.g. Ruppert, 2013; Ruppert et al., 2013; Uprichard, 2012; Webber, 2008), the most obvious possibilities with regards to new methods of presenting knowledge relate to digital media. The structure of a wiki, for example, would be an apt method for presenting a non-linear account by distributing its contents across a number of pages connected via hyperlinks which can be followed in any order. Latour and Hermant's (1998) *Paris: Invisible City* demonstrates an alternative method: a bespoke web-based articulation of Paris that works through a mixture of image and text to produce a distributed, decentred account which is not at all dissimilar to a pinboard.

For all this, however, the problem of reduction is not only a practical issue but a conceptual issue as well. Above, in discussion of how the principles of the pinboard were applied in the context of Chapter 4, it was asserted that the Chapter performs telemedicine primarily in a disaggregated manner by separating enactments of telemedicine from their contexts. However, pointing towards the 'typical' version of telemedicine explicated at the start of the Chapter, it was also asserted that telemedicine can be articulated in an aggregated manner instead, in which case different enactments are performed in context. Hence, there are at least two possible pinboard accounts that could be written with regards to early US telemedicine, the first (as in this thesis) focusing on disaggregated enactments of telemedicine and the second focusing on aggregated enactments which take telemedicine projects as wholes. And in performing one, the other is implicitly erased.

Generalising this point, the enactment of a pinboard account implicitly erases the order and coherence that are produced through other methods of social science. A case in point here is the pinboard in Chapter 6. While many of the narratives in that Chapter could be rendered into a coherent account, the use of a pinboard approach has rendered the links between them opaque by refusing to make those links explicit. Hence, in fact, the pinboard performs the same kinds of reduction as performed by conventional methods of social science but in reverse.

Reflexions: *TV Tropes*

The website *TV Tropes* (http://tvtropes.org) is a terrible and dangerous place in which it is all too easy to become lost. Constituted by a seemingly endless catalogue of different tropes used in television, film, theatre, literature, video and table-top roleplaying games, its entries are engaged in a constant series of comparisons and juxtapositions which link (literally) together to produce a labyrinthine web of articles. Here is an illustration:

> "Dramatic Pause
>
> Pretty self explanatory, the Dramatic Pause is a beat or two of silence with no dialogue and little or no music/background sound. Usually done to heighten the anticipation before **The Reveal**. Also called a "Pregnant Pause", it can also follow the reveal... it's just that shocking! It's fairly common in situations where **it takes a moment for the joke to sink in**. In sequential art, it is often depicted by a **Beat Panel**…
>
> "The print equivalent (what you see in Literature and sequential art) is the **Dramatic Ellipsis**.
>
> "A single-note (or chord) version of this is called a **dramatic sting**…
>
> "Often used in **Arson Murder And Life Saving**.
>
> "Compare **Beat**, which is shorter, and usually used for comedic effect. Also see **Stop and Go** for the musical version" (TV Tropes, 2014)

While this is only a short example it is sufficient to demonstrate the structure of the articles. An outline of the topic – the 'dramatic pause' – is presented at the beginning of the article followed by an explication in relation to other tropes. Hyperlinks, displayed in bold in the quote, allow the reader to follow these associations thereby expanding the account without producing hierarchy or linearity. Furthermore, the article multiplies its topic by referencing and linking to similar topics in different contexts and, at the end, to related but contrasting versions. In addition, though this is not shown in the illustration, the article is supported by a series of concrete examples of the trope in action.

TV Tropes, then, works through description, constant comparison and juxtaposition to articulate its topics. With a little adjustment, this structure would work effectively

means of presenting the material in this thesis. Using Chapter 4 as an example, each article would present an exhibit articulating a particular enactment of early telemedicine and be accompanied by a discussion which would draw comparisons and contrasts with other articles and provide links to them. With no limitations on the amount that could be presented, the account could go on indefinitely and even be added to over time. Hence, rather than articulating enactments of early telemedicine in a chain, instead it would be articulated through a non-linear web which can be explored in a multitude of ways at the discretion of the reader. That, then, is one possible method of presenting a digital pinboard.

Articulating complexity and non-coherence, the pinboard method therefore erases those realities which do cohere with one another.

Drawing this conclusion reprises Law's argument about method outlined at the very beginning of the thesis:

> "Method… unavoidably produces not only truths and non-truths, realities and non-realities, presences and absences, but also arrangements with political implications. It crafts arrangements and gatherings of things – and accounts of the arrangements of those things – that could have been otherwise" (Law, 2004: 143)

The pinboard is no exception. Yes, through a process of constant contrast the pinboard method articulates and performs complex, heterogeneous and non-coherent realities. In doing so, it resists the reduction performed by conventional social research methods which, in producing smooth coherent accounts of reality, erase those realities which cannot be rendered coherent with the narrative produced. But concurrent with this, the pinboard too reduces reality by erasing order and coherence in its preference for the articulation of difference. The pinboard, then, is *complementary* to other methods of social research: while it resists the reductions performed by conventional social research methods it nevertheless relies on those other methods to resist its own reductions.

Conclusion

The purpose of this thesis has been to present an exploration of the pinboard method in practice. In doing so, it has offered an explication of the pinboard in principle and has also illustrated the pinboard through a number of case studies of early telemedicine. Through

these case studies, the pinboard has been contrasted with accounts produced by conventional methods of social research so as to highlight the pinboard's features. And finally, a discussion has been presented outlining the pinboard's uses and liabilities.

The pinboard itself has been explicated as a method for articulating and performing complex, heterogeneous realities and does this through juxtaposition and pastiche. The core analytical practice of the pinboard is a process of constant contrast: a continuous juxtaposition of texts, concepts, themes and narratives undertaken to work out and accentuate their differences. Thorough this, the pinboard produces broad accounts which gather together a multitude of realities which would, ordinarily, only be partially connected and therefore not performed together in the same space. It is by gathering together partially connected realities, then, that the pinboard performs complexity.

The implications of this thesis are twofold. Firstly, the thesis demonstrates the pinboard as a viable method of social research. Furthermore, it constructs a more explicit outline of the pinboard as a research practice than is done in the few other texts which develop it. Secondly, however, it also points towards the necessity of further studies exploring the pinboard in social research. While the viability of the pinboard method has been demonstrated, it is not apparent from this study how effective the pinboard would be in the context of more conventional sociological topics. Furthermore, a number of practical issues inhibit the articulation of complexity produced through a pinboard account which might be overcome through the development of new digital methods of organising and presenting social-scientific knowledge. Hence, if the viability of the pinboard method has been demonstrated then it nevertheless remains a method in-the-making.

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Appendix A

Archive and Participant References

Archival Materials

Archival material is referenced by using the following codes along with the box or shelf number of the item and specific folder/section within that box where such divisions were used:

NLM 2008-002: National Library of Medicine, Benschoter, Reba Collection, 2008-011

NLM 2009-011: National Library of Medicine, Bashshur, Rashid L. Papers, 2009-060

NLM 2009-060: National Library of Medicine, Bashshur, Rashid L. Papers, 2009-060

MLM NPI: McGoogan Library of Medicine, Special Collections, NPI Collection

AHSL HT 0001: Arizona Health Sciences Library, Special Collections, STARPAHC Archive AAT 2001-01; Telemedicine Collection #1

For example: (NLM 2008-002: 4) refers to box 4 in the 'Benschoter, Reba Collection' held at the National Library of Medicine.

Note that in no cases are folder/division identifications given for the archives at the National Library of Medicine and McGoogan Library of Medicine. In the case of the former, the collections used had yet to be processed and therefore lacked any kind of coherent structure. In the case of the latter, there were simply no useful markers available for delineating the sections.

Interviews and Personal Communication

All references to data produced through communication with the four participants listed on page 74 are given in the form of the participant's full name followed by either 'interview' if the data was produced in interview or otherwise 'personal communication'. For example: (Maxine Rockoff, interview) is a reference to the interview undertaken with Maxine Rockoff.

Appendix B

Example Interview Script

Interview with Maxine Rockoff – Themes and Topics

Background Information – About the HEW/HCTD/Division of Health Care Information Systems and Technology of the Bureau of Health Services Research

- Profile on the University of Columbia Medical Centre Website indicates that Maxine was a "Program Officer" for the HEW between 1971 and 1978.
    - Check this is the case;
    - Check whether she had any engagement with telemedicine since leaving this post, specifically in the 1980s or turn of the 1990s, to get a feel for what is going to be appropriate.
- About the HEW/HCTD/whatever:
    - What was their function/role?
    - What was Maxine's role within this department?
    - How did the department/section operate – what was their structure; how were decisions made; how many people were involved in projects; was there much contact between project teams (if indeed these even existed); was there much influence from central government policy; etc.?
    - In the late 1960s/early 1970s, what were the main priorities of the department/section (specifically related to healthcare)?
        - Where did these priorities come from/how were agendas constructed?
        - *Who* was responsible for agenda/setting?
    - What was the scale of the research activities at the time (relative to other sources of funding?)
        - Was there a lot of competition for funding?

Telemedicine – Establishment of early 1970s projects

- How and when did the idea of telemedicine come to the attention of the department/section?
    - Why did it generate interest?
    - What was important about telemedicine that interested the department in funding a research program examining telemedicine?
        - What were the alternatives?
    - Was there much expectation about telemedicine at the time? How optimistic were those involved in organising the funding for projects?
    - Was there much influence from wider public/professional debate, or from central government?
- There seems to have been an explicit strategy worked out in terms of the funding of telemedicine projects in the early 1970s.
    - Could she indicate what this was?
    - Why was this approach adopted?
    - Particularly thinking of:
        - Why a call for applications (i.e. why not design projects or produce specifications)?
        - What preliminary work was done to find out about telemedicine and pitch research ideas (like seems to have been done in the memorandum I was sent)? Was there much in the way of consultation with existing telemedicine projects?
        - Was there much interest in telemedicine from others? Was there much competition for funding?
        - What were the criteria for research/funding?
        - What were the mechanisms for deciding between contract applications?

        - What was strategy behind the funding choices that were eventually made?
        - What kind of data did the department hope/want to get out of the research projects? What were the priorities here?
        - Was there any kind of policy on the *kinds* of evidence that were appropriate; evaluation methodologies or strategies; or anything like that (from Ben Park's writing, this appears to have been, if anything, a *product* of the projects).
        - What informed the decision to schedule regular meetings rather than to focus on official publications? Was there much in the manner of publication from the projects (doesn't seem to be)?
        - Were there any long term plans regarding telemedicine from the off-set?
            - If so, why these plans? Where did they come from? How were they formulated?
            - How did these fit into the overall health policy objectives of the department/government?
- What were the main motivations and interests of those undertaking the telemedicine projects.
    - By illustration, consider some of the ideas stemming from the memorandum she sent, such as the desire to expand patient populations and, essentially, to tap new markets of health care.

<u>Telemedicine</u> – About the projects themselves

- Can she describe (in as much detail as possible) the course of events relating to the actual projects (what was going on, what others were doing, the mood, etc.)?
- How much interaction was there between the projects, or between the HEW funded projects and other external ones?
    - What was the research environment/culture like (were people happy and willing to share?)?
- What went on in the research meetings?
- How much involvement did Maxine have with the projects once they were operational?
    - And, was there much involvement directly from others in the department?
- For any projects she did have direct experience with, ask her to describe in as much detail as she can the projects, their operation, and the people and technology that were involved.

<u>After the Projects</u>

- What were the main conclusions drawn by the department regarding telemedicine.
    - Successful projects?
    - Useful technology?
- There does not appear to be any follow-up research initiated by the department: is this is case?
    - If so:
        - Why?
    - If not:
        - What were these other projects?