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**THE ORGANISATION OF TECHNOLOGY AND
THE TECHNOLOGY OF ORGANISATION:
THE VEHICLE MOUNTED DATA SYSTEM AND THE
PROVISION OF UK FIRE SERVICES**

Martin Patrick Brigham

Industrial Relations and Organisational Behaviour

Warwick Business School

University of Warwick

A thesis submitted in fulfilment of the requirements for the

Doctor of Philosophy in the Faculty of Social Studies,

Warwick Business School, University of Warwick

June 2005

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Acknowledgements

This thesis has taken a long time, and this has meant that family, friends and colleagues have suffered my preoccupation with this research. First and foremost, my wife, Bitten, has shown enduring love and constant support as we shared the ups and downs of doctoral research. Our now 18 month old daughter, Anna, has, in the final stages of writing, peeped round the door with a playful smile, wondering, I think, what I was up to. This thesis is, then, for Bitten and Anna—in memory of the future. My parents have always supported me but in recent times they have looked on from Norfolk not quite knowing how to help. Bitten, Anna and mum and dad will be delighted to see this thesis finally completed.

My supervisors at Warwick, Dr J. Martin Corbett, and Professor Gibson Burrell now at Leicester, have played a formative role in shaping my thinking about organisation and technology. I remain indebted to them. This thesis and my approach to scholarly work generally would not be what it is without their insights. Additionally at Warwick, Professor Paul Edwards provided teaching experience and exposure to his thorough approach to academic work. Jan Woodley helped with advice in the final stages of thesis submission and Lesley Innes always provided a cheerful smile at the Doctoral Programme office. I would also like to acknowledge my examiners, Professor Karen Legge and Professor Martin Parker, for their incisive questions and comments on this thesis.

At my new workplace at Lancaster University, I count myself fortunate to have convivial and scholarly colleagues. They all deserve to be acknowledged, but Professor Frank Blackler deserves a special mention for guidance and helping to move this thesis along, as does Dr Colin Brown for sharing his breadth of knowledge, Professor Stephen Ackroyd and Professor Lucas Inrona for encouraging words, and Professor Brian Bloomfield, Dr Niall Hayes and Dr Bogdan Costea for support and pressing me to submit the thesis.

At Warwick, Lancaster and beyond, I would like to acknowledge the friendship and discussions over the years with a number of people. In particular Dr Matthew Britnell, Rob Robinson and Trevor Steele, but also Andreas Biermann, Dr Steffen Böhm, Noel Carroll, Professor Steve Cummings, Dr Manuela Faia-Correia, Jette Hansen, Philip Humphrey, Dr Paula Jarzabkowski, Dr Chris Land, Dr Iain Munro, Leila Muth, Dr Gerardo Patriotta, Gary Page, Olivier Rattle, Dr Bridgette Sullivan-Taylor and Peter Taylor, Dr Torkild Thanem, John Tighe and Dr Martin Wood.

Finally, I would like to thank Hereford and Worcester Fire Brigade for granting me access to research their brigade and the VMDS and all those working at Hereford and Worcester Fire Brigade for their interest, time and help. I would also like to acknowledge the financial support of a doctoral studentship from the Economic and Social Research Council (R00429534042), without which this research would not have been undertaken.

Abstract

Social and organisation theorists have become increasingly interested in studying information and communication technologies over the last two decades. This thesis examines how information and communication technologies are organised, and what is organised by information and communication technologies. The thesis contributes to the interest in detailed studies of information and communication technology through an analysis of the implementation and deployment of a mobile data system—the Vehicle Mounted Data System (VMDS)—by firefighters, fire crews and officers at a United Kingdom fire brigade. This thesis examines what becomes of the Vehicle Mounted Data System when it is introduced into a UK fire brigade. This includes an exposition of how recurring issues including the boundaries of the brigade, what is meant by standardisation and risk, what counts as information, and what is understood by devolved incident management is reordered as the VMDS becomes a constitutive part of the problematic fire service provision.

The VMDS is bound up with reality constituting effects and this means that what is meant by technology and organisation becomes an important topic of scholarly study. This thesis develops a non-essentialist ontology of technology and organisation—an ontological turn in organisation theory. It is argued that the VMDS is a relational effect that is aligned with existing boundaries and assumptions at Hereford and Worcester Fire Brigade, that the VMDS is a multiple object that is a mutable mobile and is deployed not only to manage safety at incidents but also for managing performance and organisational flexibility, and that the instabilities of the VMDS are responded to ambivalently by various actors as they are enrolled in the collective upkeep of the VMDS. In analysing the Vehicle Mounted Data System a range of analytical resources are drawn upon, including, most significantly, actor-network theory, but also the writings of Deleuze and Guattari. The thesis concludes with a discussion of the politics of theory and suggests that researchers would remain faithful to their intellectual tradition and a sense of critical and creative purpose if they engaged with and helped to construct the heterogeneous ways in which technological devices such as the Vehicle Mounted Data System transform what organisation theorists understand by organisation.

Abbreviations

ANT	Actor-Network Theory
ARO	Actant-Rhizome Ontology
BVPI	Best Value Performance Indicator
BVR	Best Value Review
CACFOA	Chief and Assistant Chief Fire Officers' Association
CAD/CAM	Computer Aided Design/Computer Aided Manufacture
CFBAC	Central Fire Brigades Advisory Council
CHEMDATA	Chemical Data/Information
CPA	Comprehensive Performance Assessment
CRR	Central Risk Register
FBU	Fire Brigades' Union
GIS	Geographical Information System
GPS	Global Positioning Satellite
HMFSI	Her Majesty's Fire Service Inspectorate
IT	Information Technology
ICT	Information and Communication Technology
LGU	Local Government Association
NJC	National Joint Council
ODPM	Office of the Deputy Prime Minister
OED	Oxford English Dictionary (New Shorter Version)
OMPIS	Output Measures and Performance Indicators Scheme
OS	Ordnance Survey
PFI	Private Finance Initiative
PI	Performance Indicator
RFU	Retained Firefighters' Union
SCOT	Social Construction of Technology
SSA	Standard Spending Assessment
SSK	Sociology of Scientific Knowledge
STEP	Single Tier Entry Promotion
TIP	Tactical Information Plans
VMDS	Vehicle Mounted Data System

Chapter 1: Introduction

1.1 Introduction: Pyrotechnics

Fire is associated with human culture but also symbolic of heavenly and earthly powers. In early myths, fire is considered to be a living being which possesses good or evil intentions (Pyne, 2001). The completion of humankind is also often related to the bringing of fire and with this the beginning of a distinctly human civilisation in the face of the universe's forces or a ruling deity. Frazer (1930), for example, provides an anthology of myths from around the world that sets out humanity's conquest of fire, often through cunning or luck. According to Levi-Strauss (1969), learning to control fire is related to making durable metals from minerals and enabling the cooking of raw foods. Use of fire marks out humankind as distinct from other animals. Similarly Darwin (1989: 49) remarks that, except for language, 'the discovery of fire, probably the greatest ever made by man, dates from before the dawn of history' (quoted in Goudsblom, 1992: 2).

The most well known myth related to fire, in Western culture at least, is the myth of Prometheus. The Greek poet Hesiod (c.700 BC) tells how the brothers Prometheus and Epimetheus, Titans who inhabited the earth before humankind, were responsible for endowing animals and humans with various abilities. Prometheus brought fire to earth to bestow humankind with a unique ability after other animals had been allocated various capacities. The myth continues that Zeus, the supreme deity, took back fire from humankind after he had been insulted by Prometheus. Prometheus was, however, the supreme trickster and in order to return fire to his human children he hid fire in a fennel stalk. In returning fire to humanity, Prometheus had invented 'all the arts of Man' (Barry, 2000), but for this act of defiance Prometheus also incurred the wrath of Zeus. For defying him, Zeus created the first woman, Pandora, and sent her to Epimetheus who married her against Prometheus' warning. In one version of Hesiod's myth, out of curiosity Pandora

opened a jar which Epimetheus had in his house and with this released a multitude of plagues, evils and toil onto the earth. Only hope was left in the bottom of the jar.

For the purposes of these introductory remarks the myth of Prometheus can be read as a story of purification and transformation. The myth is a metaphor for what marks out humankind as distinct—as skilled users of tools—from other animals. Mastering the burning of combustible material is one of humankind's essential tools and it is through this mastery that humankind can begin to transform the forces of the universe and shape the future in its own image. The vocabulary of contemporary technological innovation is similarly one in which technologies as tools play a 'supporting', 'aiding' or 'mediating' role for human intentions and competencies (see Sotto, 1996). In conjunction with this, one of the most discernible characteristics of popular narratives of technological change is that they are usually debated in terms of the risks, opportunities and effects of specific technologies. The assumption that fosters the preoccupation with specific technologies is also that technologies are instrumental tools for human-centred action. Issues and problems arising from particular technologies are important and require intervention, but this emphasis upon specific technologies neglects how 'the technological' constitutes capacities to act and is implicated in the exercise and durability of relations of power and domination. Auxiliary infrastructures and social practices that have developed over time often do not usually feature strongly in accounts of stand-alone technologies based upon instrumentalist assumptions. In analytical terms, instrumentalism denotes the marginalisation of the range and diversity of social, scientific, technical, political and cultural activities that constitute capacities to act and the relational effect of a technology.

The unquestioned assumption that humans and technologies are ontologically distinct and independent provides a basis for advanced technologies to give an enhanced 'informational' or 'communicational' connection between a separate humankind and the

environment. Kaufman-Osborn (1997: 36-7) describes the purification associated with instrumentalism as the 'Cartesian paradigm of use'. In this paradigm information and communication technologies 'bridge the gap' between the 'intentionality of Descartes' mind', and humankind more generally, and 'intersecting, inertial objects of Galileo's nature'. Echoing this, Wise (1997) describes the production and durability of the dualism between the intentional subject and passive object as the 'modern episteme'. It is, he argues, through the deployment of instrumentalist assumptions that the separation of subject and object is produced and maintained, and this means that information and communication technologies can remain unproblematised as neutral tools whose deployment and use is the outcome of collective human projections and motivations.

How, then, might technologies be thought otherwise? An easy question to pose but not so easy to answer. Winner (1995: 67) is sceptical of the potential for thinking otherwise about technology, not least because 'the Western tradition of moral and political philosophy has little to recommend on this score, almost nothing to say about the way in which persons in their roles as citizens might be involved in making choices about the development, deployment, and use of new technology'. Aristotle (c.350 BC), for example, delineated between two types of activity: making (*poiesis*) was associated with material activities and basic work, and doing (*praxis*) was concerned with a higher realm of politics and philosophy and associated with those free from basic material constraints (Mitcham, 1994; see Chapter 2). Despite this cultural inheritance it is incumbent upon those interested in understanding the relationship between technology and organised contexts to attempt to rethink 'the technological' in contemporary society.

One way of problematising instrumentalism is to analyse how the boundary between the human and the non-human is subject to change over time and place. Problematising the ontological distinctiveness of human capacities vis-à-vis non-human objects can be

illustrated through the changing delegation of capacities (see Bloomfield and Vurdubakis, 1994). Changing associations in relation to ‘computing’, for instance, show how capacities can be delegated to various actors but also demonstrate that what is meant by computing changes over time. Before the Second World War ‘computing’ (from the Latin *computāre* meaning to clear or settle an account, reckon or think) referred to a profession responsible for making calculations for companies involved in activities such as navigation, insurance and finance. By the late 1940s, however, the ‘computator’ had become a machine for undertaking calculations and was associated with making the world intelligible in new machine-based ways (Kaufman-Osborn, 1997: 43). By the 1990s ‘computers’ were firmly established as a category for making sense with, positing an image of the post-industrial structure of society as one of networked connections, with human brains providing the software (see for example Castells, 1996).

Another way of problematising the assumption that technologies are tools for human intentions is by reading the myth of Prometheus through recent continental philosophy and studies of science and technology in action. Prometheus’ bestowal to humankind of the capacity to master fire is associated with making humanity what it is—fire is constitutive of the human condition. Endowing humankind with the ability to control fire is, in other words, associated with transformation as well as purification. In this sense the myth of Prometheus takes a Derridean path because fire is equated with an ‘original technicity’: ‘technology has not simply added itself, from outside or after the fact, as a foreign body. Certainly, this foreign and dangerous supplement is “originally” at work and in place in the supposedly ideal interiority of the “body and soul”’ (quoted in Mackenzie, 2002: 5-6). The ability to culture fire is not something added to an already formed and independent human nature, it is rather inter-constitutive with humankind through relations of projection and

reciprocation (Scarry, 1985). This suggests a more general conclusion, that is, that technologies cannot be reduced to instrumentalist assumptions.

Latour (1999) illustrates transformation of subjects and objects through the debate surrounding the 'right to bear arms' in the USA (see also Grint and Woolgar, 1997). For Latour (1993, 1996, 1999) and others one way in which reality is articulated and made visible is through the mediation of the technological. In this sense, politics occurs within the world making and unmaking activity of the technological. Latour (1993, 1999) describes the transformation of humankind not in terms of pre-modern and modern but as changing relations and capacities between humans and non-humans. In Latour's (1999) terms, however discrete a technology seems to be, it always presupposes a comprehensive range of heterogeneous relations for its typical ontological durability: it is relational materiality that produces the effect of a technology (see Law, 1992). In addition, because technologies are relational effects they are transformed as they 'travel' between places and over time and refashion the context into which they are introduced in ways that surpass intentions and that cannot be predicted in advance completely.

'Guns kill people', say those who wish to control the sale of guns. This is countered by the National Rifle Association's well-known slogan 'Guns don't kill people; people kill people'. Either the gun's components make an ordinary person into a killer or the gun is a tool and neutral carrier of human intentionality. Latour suggests these two positions are absurd in many respects, although popular debates about guns (also technology more generally) are often posed in these stark terms, as neither those who would wish to control guns or control citizens would argue that guns kill by themselves or that the gun has no role in killing.

Latour (1999) suggests that instead of the myth of the autonomous or neutral gun there is a 'third possibility'. This third possibility Latour terms 'goals translation', where translation is not the substitution of one thing for another, nor corresponds to the gun's or person's 'program of action', but is a technical mediation that is made up of an open-ended displacement, delegation and drift between human and non-human capacities that heralds 'the creation of a link that did not exist before and to some degree modifies the original two' (Latour, 1999: 180). With this third possibility the actor is neither the gun nor the citizen but the becoming-citizen-of-the-gun (a 'citizen-gun') and the becoming-gun-of-the-citizen (a 'gun-citizen').

The becoming-citizen-of-the-gun and becoming-gun-of-the-citizen is a transformation/translation that turns both citizen and gun into someone and something else. A gun at a gun club is part of an infrastructure of shooting ranges, locked gun cabinets and social engagements for the gun enthusiast including competitions for accuracy and speed. Removing the gun from the storage rack and taking it home translates the technical infrastructure and social practices the gun previously occupied into relations with domestic activities and protection from intruders. Star and Ruhleder (1996), drawing upon the interactionist tradition, argue that a tool does not comprise of pre-given capacities, rather a 'thing becomes a tool in practice ... when connected to some particular activity' and the meaning that is projected onto it. For Latour (1999: 179-80), by contrast, taking the gun from the gun club to the home produces a different subject and a different object. A law-abiding gun enthusiast can become a criminal, a gun locked in a storage room can become a gun used against a stranger (but also, in a struggle, by the stranger) in the home, and a gun used for sport can become a gun used as a weapon in defending hearth and home. Both subject and object become 'someone and something' else (Latour, 1999: 179-80). To posit

the gun as a discrete object is to miss the range of 'associations' with which gun and gun-user are constitutively implicated.

The emphasis upon relational effects means that dualism between the subject and object can be reworked from the Cartesian paradigm of use into one of mutual dependency where subject and object can become 'someone and something' else. The analytical significance of this is that neither subject nor object are complete in themselves but are mutually constitutive moments that 'gain their ontological character through the position they occupy within the shifting relationships operating across the complex of elements in which they are embedded' (Brown et al., 2001: 129). This 'ontogenesis of things' (Mackenzie, 2002) is, according to Kaufmann-Osborn (1997), what Marx' meant by his famous aphorism 'humans make their own history but not according to their own making'. Elsewhere, Brown et al., (1998) suggest that this 'ontological relativism' is a way of reanimating politics and of maintaining debate because it is a form of analysis that is concerned with how reality is assembled and is sceptical of the eternal nature of things. This is coupled with an 'epistemological realism', which they define as a serious engagement with what is articulated and 'goes on' in everyday activity, and what occurs with the suspension of knowing as incomplete and contingent.

The focus upon purification and transformation also problematises approaches to the relationship between the context of activities and the content of activities that construe content within context. Social studies of science and technology, for example, emphasise the wider global, societal or sectoral contextual factors or variables that shape the content of scientific practices or technological development. These externalist studies have made significant contributions to rethinking the 'essence' of science and technology, however what is often missing is a sustained analysis of the constitution of the context. Actor-network theorists such as Latour, Callon, Law and others suggest that analysing technology

against a broad societal backdrop gives too much away to the stability of the context. In response, the task is to problematise purified accounts of context and content by focusing upon the activities of contextualisation and decontextualisation that constitute context and content.

De Laet and Mol (2000) draw upon Serres (1982a) to develop an analysis of the mutual constitution of context and content. Serres describes how ‘the nature of an object varies with the methods by which it is measured, assessed or appropriated. There is, for instance, no “length” of the coast of Brittany ... for the length of the coastline followed by foot is different from that covered by following the highway; from the water the coastal length is quite another matter. Not only is the distance different in each of these instances; each length, by including its specific mode of measurement, is a different thing’ (quoted in de Laet and Mol, 2000: 262). Different contexts are enacted in order to constitute different ways of measuring the north-western French coastline. Posed in this way, the distinct boundary between context and content is problematic and requires careful analysis. It is, rather, like the dancer and the dance (Scarbrough and Corbett, 1992), an intimate embrace that is mutually constitutive.

Latour (1993) describes how the content and context of science in the making, technological ‘diffusion’ and the spread of ideas requires the crossing of ontological boundaries by ‘hybrids’—comprised of quasi-subjects and quasi-objects that are mixtures of social, technological, professional and political interests and activities. Callon’s (1987) study of Electricité de France (EDF), a French state enterprise, illustrates how a broad social vision—setting out a societal context—is constitutively intertwined with the setting out of the technical equipment that is appropriate for the particular social context. EDF planned to introduce an electric car to French citizens, but to be successful EDF had to convince a sceptical French population and rival car manufacturers of the need for a new

type of automobile and produce workable devices such as fuel cells. Callon analyses how EDF's attempts to introduce an electric car are marked out by the deployment of rhizomatic hybrids that traverse ontological boundaries and constitute the context and content of future developments. This occurs simultaneously with the separation of society and technology into distinct ontological categories. The adoption, institutionalisation or failure of electric cars is dependent upon various actors' abilities to manage the 'trials of responsibility' in which hybrids are involved, and downplaying the 'ontological gerrymandering' (Woolgar and Pawluch, 1985) between the social, cultural, technical, professional, environmental and scientific.

1.2 Overview of the Empirical Research

This thesis examines how information and communication technologies are organised, and what is organised by information and communication technologies. It is argued that this is an ontological activity that separates out what is 'technology' and what is 'organisation' and then reconnects entities in particular ways. In specific empirical terms the thesis examines how the implementation of advanced information and communication technology at a UK fire service is problematised as necessary for incident management by a UK fire brigade, and how the technology is deployed as part of the problematic of fire service provision and is bound up with transforming what is meant by reform and modernisation of the public sector; the role of computer-mediated information in front-line firefighting; the effect of standardisation and universal practices; how hierarchies and fire crew flexibility is enacted; and, what is understood as risk. Because organising technology is an ontological activity the approach developed in this thesis provides a way of thinking about the mutual transformations of technology and organisation when a new actor is introduced to an organised context.

In terms of the empirical focus the thesis is concerned with the purifications and translations associated with the implementation and use of the first UK fire service 'mobile data system'—the Vehicle Mounted Data System or VMDS at Hereford and Worcester Fire Brigade. The VMDS is an integrated incident information management system that can be used on the move and at incidents. It provides standardised and real-time on-screen information to fire crews and officers. Hereford and Worcester Fire Brigade installed the VMDS on 36 fire appliances in March 1996 in response to an Improvement Notice served on the brigade by the Health and Safety Executive after the death of two of its firefighters at a large factory fire in 1993.

The VMDS is comprised of a 9.4 inch screen and keyboard mounted on the front dashboard of the fire appliance and linked to an in-cabin printer (see Chapter 5, Plate 5.3.1). The VMDS brings together a wide range of operational information that was previously held on paper, kept by fire crews in appliances and at stations, and communicated by radio. The VMDS provides risk information on buildings on a Central Risk Register (CRR), with a number of records containing CAD/CAM building plans and first response tactical plans for large-scale risks. The VMDS also comprises of standard incident procedures for officers, chemical information, which was previously transmitted by radio, and Ordnance Survey maps detailing the location of water hydrants. The VMDS is updated by Hereford and Worcester Fire Brigade's Operational Intelligence Unit, which is responsible for maintaining risk records from crews' fire safety inspections in the form of two-page VMDS based Tactical Information Plans (TIP), amending operational procedures, and providing CAD/CAM drawings for central risk records held on the VMDS.

There is currently intense interest in the modernisation of fire service provision across the UK (e.g., Bain et al., 2002). The preoccupation with reforming the fire service over the last

ten years is represented in diverse ways, including the introduction of techniques for comparative performance measurement; the comparative management of costs through best value reviews; the restructuring of an institutionalised relationship between fire service professionals; the government and union representatives; and attempts to foster an effectiveness, efficiency and responsiveness based upon new forms of risk analysis and localised working practices. The role of information and communication technologies in attempts to reform the fire service in the 1980s and early 1990s were minimal, attracting little attention in national reviews of fire service provision (e.g., Audit Commission, 1995). From the mid- to late-1990s onwards, however, there has been an increasing interest in mobile information and communication technologies for front-line incident management.

The implementation of the VMDS was initially posed in terms of responding to the need for safer working practices at incidents. Throughout the 1990s and early 2000s fire services introduced brigade-centric Vehicle Mounted Data Systems that provided information 'on the move' to fire crews, with access to information demarcated to a particular brigade. At the time of writing, a significant number of fire brigades across England, Wales and Scotland have implemented or are introducing the VMDS for front-line fire service provision. This includes brigades in Cumbria, Devon, East Sussex, Lancashire, Norfolk, Nottinghamshire, Northamptonshire, South Wales, Strathclyde and Surrey. Collaboration on VMDS procurement and information management practices has taken place between the brigades of Northamptonshire and East Sussex, with the intention of providing VMDS services that can be purchased by other brigades across the UK. In 2004 the VMDS speaks for the context of fire service provision.

1.3 Structure of the Thesis

This thesis, including the introductory chapter, is comprised of nine chapters. Chapter 2 critically examines different approaches to understanding 'the technological'. Together with Chapter 3 this chapter sets out the ontological and epistemological assumptions that underpin the thesis. The chapter begins by situating 'the technological' within long-standing philosophical and political debate and discusses deterministic, humanistic, 'end of ideology' and substantivist approaches. This is followed by a discussion of Critical Theory and technology, and social constructivist approaches to technology. The longest part of this chapter sets out the tenets and assumptions of actor-network theory and discusses how Deleuze and Guattari's concern with rhizomatic movement and assemblages can contribute to actor-network theory.

Drawing upon points made in Chapter 2, Chapter 3 is concerned with a critical and creative examination of the ontological status and boundaries between technology, organisation and the human. This chapter starts from the proposition that current interest in organisational analysis in 'becoming', as an instantiation of transformation, is often connected to Nietzsche, Bergson and Deleuze, but is also integral to the actor-network approach set out in the previous chapter. Recent process philosophy approaches to organisational analysis, for example, draws upon Bergson and Deleuze (see Chia 2003, 2003a; Tsoukas and Chia, 2002; Wood and Ferlie, 2003) to discern becoming as anti-organisation. Actor network theorists, by contrast, have been accused of over playing stability, managerialism and organisation—a network functionalism—and as such narrowing the bases of becoming/transformation. In this context, process theory might provide valuable insights for those interested in using actor-network theory. The argument set out in this chapter is, however, that current depictions of process theory in organisation theory falls short in a number of critical respects.

This chapter critiques current deployments of process theory in organisation theory as a way of reanimating the radical import of actor-network theory's emphasis on transformation. *Contra* process philosophy approaches, this chapter argues that the depiction of 'mechanical experience' as 'being', and 'pure lived experience' as 'becoming' that is characteristic process philosophy in organisation theory misconstrues becoming to the extent that becoming is posited against a sense of enduring technological devices, organisational forms or the human subject. It is argued that what is critical and creative is, rather, a particular form of evaluation that does not mistake relational effects for discrete causes. From this it is argued that positing organisation as distal or proximal (see Cooper and Law, 1995), humans as possessive or relational selves (see Lee and Brown, 2002) and technologies as wholly determining or under-determined is problematic and re-enacts ontological divides. This chapter concludes by discussing the implications of 're-socialising' process philosophy through actor-network theory's emphasis upon translation, purification and mediation.

Chapters 4 and 5 provide a change of focus from the previous two chapters, with Chapter 4 concerned with contextualising fire service provision in the UK. This chapter contributes to the hitherto sparse social scientific literature on UK fire services. The chapter briefly introduces the managerialism associated with public service provision from the early 1980s onwards, and discusses the particularities of the institutional context and internal politics of fire service provision. This chapter provides facts and figures for national standards of fire cover, risk categories, fire crew levels and fire service stakeholders in order to underline the importance of detailed empirical contextualisation for later chapters. Issues relating to two recent national fire service reviews are then discussed in terms of political interests and professional power. The final part of this chapter provides an outline of the debate on

mobile information and communications in the fire service as a precursor to Chapters 6, 7 and 8.

Chapter 5 describes methods, issues, practices and propositions relating to the research. This includes a discussion of negotiating access, conducting research and analysing empirical material. The chapter also provides additional detail about the VMDS. It looks at theoretical and methodological issues and tensions in undertaking research and analysing 'data', with a brief discussion of the strengths and limitations of the research in terms of the conduct of fieldwork and analytical contribution.

Chapter 6 is the first of three empirical chapters. Each of these empirical chapters draws upon a range of primary and secondary sources relating to the VMDS, but also develops analytical points made in previous chapters. Chapter 6 is concerned with conditions for the introduction of the VMDS at Hereford and Worcester Fire Brigade through an examination of the mutual constitution of the context of fire service provision and the content of the VMDS. The problematisation of fire service provision after a major incident in 1993 in which two firefighters died is discussed in terms of non-essentialist relations between the discursive and non-discursive. This provides the basis for an exposition of the first part of an 'ontological turn', that is, an exposition of practices of differentiation, problematisation or making determinate. The chapter argues that the implementation of the VMDS cannot be separated from previous paper-based practices, and, further, that the connection between previous practices and the VMDS marks out the way in which information is characterised by relations of presence and absence. Chapter 6 then goes on to discuss the relationship between the universal access afforded by the VMDS, the centralisation and formalisation of informational practices set up by a newly formed Operational Intelligence Unit, and standardisation within and between fire brigades. It is argued that, contextualised by the potential regionalisation of fire service provision, the VMDS is linked to the reproduction

of the power of brigade-centred practices. The VMDS is a new actor at Hereford and Worcester Fire Brigade that is accepted by fire crews because the form of standardisation it constitutes is aligned with the existing structures, practices and assumptions of the provision of fire services.

Chapter 7 examines three translations/transformations associated with the VMDS. Translation is discerned as the second part of an 'ontological turn', that is, comprised of differentiation or making different. The first translation examined is how the VMDS is mobilised to monitor and record fire crews' performance. This occurs through the top-down, internal connection of the VMDS to the brigade's command and control centre and the relaying of status messages to and from fire crews. The VMDS at Hereford and Worcester Fire Brigade is aligned with a broad agenda for reforming and modernising fire services, but in a way that simultaneously reaffirms the primacy of brigade-level management and coordination. The chapter continues with a mobilisation of the VMDS around the introduction of a new form of firefighter mobility termed 'global crewing'. As the VMDS is mobilised for new organisational practices for managing firefighter mobility, the delegation to VMDS-mediated mobility constitutes new forms of spatial and temporal ordering and disordering. The alignment of the VMDS and global crewing also defers other issues (such as early retiring officers and recruitment problems) and changes (including managing levels of absenteeism and stress-related illness) within the brigade. The third, attempted translation demonstrates how the technological capacities of the VMDS can be enrolled in efforts to bring about organisational change but this does not mean that the technical capacities of the VMDS can be translated in an unlimited number of ways. In this instance, translation fails to bring about changes to organisational practices centred upon a form of mobility that radicalises global crewing into mobility 'on the run'.

Chapter 8 is concerned with the ambivalences associated with the VMDS. The chapter examines how the broad appeal of the VMDS can be analysed as constructed, at least in part, through external and internal demonstrations. These demonstrations are contrasted with the situated effects of the VMDS, particularly spatial and temporal effects relating to fire crew coordination. The VMDS remains a workable device despite problematic situated effects because fire crews are enrolled and enrol other actors in the collective upkeep of the VMDS. It is argued that fire crews have an ambivalent relationship to the VMDS and that fire crews are involved in maintaining the durability of the VMDS through 'internal network building'. It is also argued that the broad promise of technologically-mediated front-line incident management based around information and communication technologies and the alignment of the VMDS with existing working practices and employment conditions are important for understanding this localised enrolment. The chapter switches focus to an examination of how the VMDS can be understood as a resource for charting the distribution and deferral of ambiguities and inconsistencies within the brigade's provision of fire services. The VMDS is associated with the contingent redistribution of tensions relating to the new brigade status and the emergence of risk management centred upon Tactical Information Plans held on the VMDS. The emphasis upon management of risk by front-line crews using the VMDS constructs the VMDS as a potent force for firefighter-centred change to fire service provision. Together with the alignment of the VMDS with current working practices, screen-based Tactical Information Plans provide a competing albeit tentative vision to recent national recommendations for the reform and modernisation of fire service provision.

Chapter 9 concludes by summarising the contribution of the thesis and discusses the analytical and political implications of studying technology and organisation as an ontological activity.

Chapter 2: Situating the Movement between Technology, Organisation and the Human Condition

'Could humans live without technologies? Clearly in any empirical and historical sense, they in fact do not. There are no known peoples, now or in historic or even prehistoric times, who have not possessed technologies in some minimal sense.... It is just for this reason that the New Garden [of Eden] must be imaginative, for we cannot tell deeply what such a Garden would mean for our experience. It remains a story, an imaginative variation. Imagine a New Eden, a tale of new beginnings, in which a New Adam and a New Eve, like the old, appear first, naked and placed in a non-technological Garden. Today the telling of such a tale should take on trappings familiar to our own context, perhaps the context of the well-informed television documentary viewer, itself the result of our scientifically permeated society'.

Don Ihde, 'Technology and the Lifeworld'.

'At the beginning of Western moral and political philosophy, speculation about techne, the realm of the practical arts, plays a prominent but largely negative role. As Socrates, Plato and Aristotle seek to define the nature of knowledge, the good, political society, justice, rulers and citizens, and the form of the best state, they frequently draw comparisons to techne, the realm of the arts and crafts, viewing it with a mixture of awe and suspicion. Foremost among their concerns is the belief that technical affairs constitute an inferior realm of objects, knowledge and practice, one that threatens to infect all who aspire to higher things.... Of all the classical arguments calling for the separation of technology from political affairs, the most significant is Aristotle's. For unlike Plato, Aristotle explores the possibilities of broadly based citizenship in political societies of many different kinds, perhaps even ones that resemble our own. As he defines the roles and virtues of a citizen, however, the crucial differences between technical and political life stand out.... Aristotle takes care to specify which persons are not capable of holding this [political] role. He points to the menial duties and craftwork that were handled by slaves and foreign workers in Greek city-states at the time. Physical toil and use of the practical arts bind one to a realm of material necessity, a condition incompatible with the unencumbered freedom needed for citizenship.... Aristotle goes even further, arguing that citizens should avoid learning the practical arts because that would be downgrading.... Thus, the making of useful things and the activities of public life must forever remain separate'.

Langdon Winner, 'Citizen Values in a Technological Order'.

2.1 Introduction

‘It is a truism that technology is increasingly central to modern life’, so say Grint and Woolgar (1997). This currently self-evident truth is however far from trivial, hackneyed or without its own historical contours. It is also almost beyond dispute that technological innovations have become increasingly visible during the twentieth century whether that is in the media, government-financed research grants topic or conversation at the local pub. Examples of technological impact are seemingly endless and this is why it is perhaps not an overstatement to claim that few other theoretical or practical preoccupations currently impinge so directly on the experience of everyday life. Is technology poised to become the central intellectual and popular concern of the twenty-first century? Is ‘the problem of technology’ the issue of our time or is this another Latourian example of how a self-evident truth demands the work of making self-evident? If technology is the question of our time, what is the status of technology given that social theorising of technological innovation has resonances with the ‘spirit of the times’?

The purpose of this chapter is to provide an account of the putative relationship between the technological, the organisational and the human. Together with the next chapter, this chapter reviews and sets out the analytical position developed throughout the thesis. This chapter does not attempt to account for the vast terrain of theorising on the technological, organisational and human, rather this chapter sets out to ‘give life’ or ‘bring alive’ relations between technology, organisation and the human (Cooper and Burrell, 1988). The chapter is organised in the following way. The following section provides some introductory remarks and some definitions of technology. Following this, Section 2.3 charts the emergence of modern technology by situating technology within long-standing philosophical and political speculation. Section 2.4 develops this preoccupation in relation to technology in terms of

deterministic and humanistic approaches and examines the assumption that technologies are instrumental devices. This provides the basis for Section 2.5, which develops the conjunction of determinism with an end of ideology account of history and substantivism. Sections 2.6 and 2.7 examines the concern with technology by Critical Theorists, notably Heidegger, Habermas and Marcuse, and this is followed with an exposition of the approach known as the social construction of technology (SCOT). Section 2.8 is concerned with actor-network theory. This is a long section as the approach deployed in the thesis draws upon a number of insights from actor-network theory (ANT), and this is followed by Section 2.9, which develops the contention that Deleuze and Guattari's work provides significant inspiration for the actor-network approach. Section 2.10 makes some short concluding remarks.

2.2 Defining Technology

One way into understanding the relationship between technology, organisation and the human is to consider the different ways in which technology can be defined. Providing a definition of technology is however by no means a simple task because of the lack of consensus about the meaning and demarcation of 'technology'. The commonsense and popular definition of technology is that it is a tool, but like all such definitions this masks as much as it illuminates. In crude terms, defining technology as a tool can be associated with an Anglo-American or analytical tradition that focuses on particular technologies and separates means from ends. In contrast to this, the continental or phenomenological tradition depicts technology as transforming the human condition and in so doing creating new capacities to act, identities and problems to contest. Heidegger (1977) is the exemplary example of this latter tradition with his approach to modern technology as a revealing of the

world which is 'made to recur and employed in the service of a pre-conceived purpose' (Kallinikos, 1996: 31).

It is useful to begin with two general introductory claims about theorising in relation to technology and a 'working definition' to introduce this chapter. The first is that approaches to defining and understanding technology often begin with definitions about what a technology is and what it is not (see also McLoughlin, 1999). Here questions of boundaries are important: is a technology the 'hardware' or does it also include the 'soft' incorporated skills, the techniques and practical know-how? Because of the difficulties in drawing a boundary around what is technical and non-technical, defining technology might be best approached not directly but through the way in which technology is discussed, elaborated, counter-posed, and so on, in accounts of what it does (see Bloomfield and Vurdubakis, 1994).

Feenberg (1999: vii) argues that society's understanding of technology is *the* contemporary democratic question so that as democratic 'movements expand the definition of humanity, they also expand the boundary of the political to embrace more and more of social life. At first, law was taken from God and King and brought under human control. Then, Marx and the labour movement placed the economy on the political agenda.... Formerly, the democratic movement gave its fullest confidence to the natural processes of technological development, and it was only conservative cultural critics who lamented the price of progress'. For those interested in delineating particular causes and effects, once a boundary is defined impacts become easier to identify, although this task is far from simple, uncontroversial or uncontested. On this point of contested boundaries, Scarbrough and Corbett (1992:3) add that 'the theoretical strategy of making a clear distinction between technology and organisations means that the operational definitions used in research have

generally tended to embrace what has been termed a “materialist ontology”. For Scarbrough and Corbett, technology and organisation are more productively thought of as ‘fluid and interlocking processes’ and this means placing an emphasis on power, knowledge and meaning.

The question of the boundaries of the ‘technological’ is also important for the distinction between science and technology. Technologies are usually associated with the application of science, that is, technological innovation is possible because of advances in scientific knowledge. This long-standing hierarchy between science and technology has been questioned by those who argue for the study of ‘technoscience’. Bradley et al., (2000) suggest that science has become increasingly associated with the technology it has created such that science cannot be separated from techniques, technologies or technicalities of making science work (see also Aronowitz and DiFazio, 1994). Latour has similarly used the term ‘technoscience’ in following the translations and purifications of scientific practice that is comprised of tools, techniques, documents, to name a few.

The second claim relates the increasingly default role associated with technology, and more particularly information and communication technology, in changing organised contexts, particularly organisational forms. The question here centres on the autonomy of technology and if, how, and to what extent technology follows its own evolutionary development outside of social, political and cultural contexts. Interestingly the default role of technology as change agent has occurred in parallel with recent approaches that, inspired by a general interest in studying the detail of practices in the social sciences, have questioned technological effects outside of social and historical contexts (Barley and Orr, 1997, for example). Paradoxically then there has been considerable social scientific research on technological innovation and change over the last two decades that has renewed rather than

replaced the importance of ‘the social’ against what common sense might suggest is outside of a social milieu (see, for example, Dutton 1996; Woolgar 2002). Within these broad and diverse approaches is an understanding that definitions of technology, success or failure and impacts can only be meaningfully understood within social contexts (see, for example, Grint and Woolgar, 1997).

An introductory and working definition of ‘technology’ can be evoked through an etymology of ‘technē’ and ‘logos’. ‘Technē’ can be understood as both an art of the mind and the skilled use of tools and techniques (see Mitcham, 1994). Technology is both involved in making something present *and* a craft skill and technique that reveals: a way of composing, knowing and reflecting on the world that is a ‘taking place’ *and* a range of practices or activities through which various projects are realised through a ‘fixing’ of relations (see Brown, 1999, 2001). Over time the study of technology has emphasised one or the other of these senses of technology, with the analytical tradition concentrating on the latter ‘fixing’ as a means to an end and the continental tradition the former as a way of composing the world. For introductory purposes ‘logos’ can be thought of as reasoned discourse about the proper nature of goodness (see Barney, 2000). For the ancients Greeks, technology was not one but two words: separate words that denoted the practices and appropriate relationship between them.

2.3 The Emergence of Modern Technology

The designation of and the movement between the technological, the organisational and the human is becoming an important and contemporary concern within organisation studies and social and political thought more generally. Yet the significance remains a contested phenomenon for disciplines with a tradition of humanism. For the purposes of introducing the human’s relationship to technology an example from Sophocles and Euripedes is useful.

Grint and Woolgar (1997: 2) describe the *deus ex machina* as a dramatic device that dates from the 5th century BC that is ‘a helpful motif in confronting idealized conceptions of the nature of technology’. In Greek and Roman dramas a *deus ex machina* was the timely appearance of God or Goddess ‘from above’ that solved a crisis and unravelled the play’s plot. Like a ventriloquist who displaces sound so that it seems to come from a source other than the speaker, the dramatic *deus ex machina* effect is ‘achieved by means of a crane (Greek: *mechane*) drawn up over or on the stage and containing an actress or actor in the role of a Goddess or God’ (Grint and Woolgar, 1997: 2).

The claim that Grint and Woolgar put forward is that the divine spirit encased in the machine is symbolic of a more contemporary reaction to technology, that is, resolution of a problem or disorder through the application of divine and external intervention embodied in a machine. But what exactly is going on here? Is it the power of the transcendent God or Goddess that brings about order whilst encased in the machine? Why does the crane not command a role as leading actant in the play? The focus on the deity in the machine prefigures more recent conceptions of technology as determining human activity because it is above everyday experience, but the general point I want to bring out here is a historical characteristic of Western culture to privilege endeavour of the ‘mind’ in which the use of technologies is debated and theorised (what can also be called ‘praxis’ or doing) over everyday technical activity (known as ‘poiesis’ or making). This culture of idealism—that is, ‘above and beyond’ the transitory everyday material world—is why the significance of technology has been mostly neglected or seen as only a means to a specified end, says Feenberg (1999: 1):

Only recently have scholars outside the technical fields become interested in their problems and achievements. In earlier times the humanities rejected discourse on technology as unworthy. That tradition goes back to the ancient Greeks who lived in aristocratic societies in which the highest forms of activity were social, political, and theoretical rather than technical.

There are several continuities between the ancient Greeks' idealism, from Aristotle (c. 350 BC) onwards, organised around an aristocratic society of praxis and the principles of modern political philosophies premised on the analytical tradition's separation of means and ends (see Mitcham, 1994). The implications are that *technē* is understood as merely way of making, of applying praxis, rather than a way of knowing in itself, technology as representation (see, for example, Kallinikos, 1996). On this issue, Sismondo (1996: 8) has argued that for Neo-Kantians representations create their own objects: 'there is some special or semantic connection from what scientists say (or do) to the structure of the material world'. Thus the productive tension between the double meaning of *technē* introduced above as composition *and* fixing in place through practical activity is lost so that *episteme* and *technē* are separated and placed in a hierarchy that Flyvbjerg (2001) traces to Aristotle:

What science [*episteme*] is ... will be clear from the following argument. We all assume that what we know cannot be otherwise than it is.... Therefore, the object of scientific knowledge is of necessity. Therefore it is eternal.... Induction introduces us to first principles and universals (Aristotle, 1976: 1139b18-36, quoted in Flyvbjerg, 2001: 55).

Episteme is about universals and knowing that does not vary according to context. *Technē* is related to *episteme* but only through the secondary application of *a priori* epistemic knowledge. This is what makes *technē* only a means: it is variable and changes depending on contexts or ends to which it is put:

[S]ince (e.g.) a building is an art [*technē*] and is essentially a reasoned productive state.... Every art is concerned with bringing something into being.... For it is not with things that are or come to be of necessity that art of concerned [that is the domain of *episteme*] nor with natural objects (because these have their origin in themselves).... Art... operates in the sphere of the variable (Aristotle, 1976: 1140a1-23, quoted in Flyvbjerg, 2001: 56).

For Aristotle, and Western social and political thought thereafter, technologies are variable in their effects because they are an instantiation of the ends to which they are put.

2.4 The Conjunction of Determinism and Humanism

It was with the publication of Diderot's *Encyclopédie*, says Feenberg (1999), that humanist scholars began to take technology seriously but like their counterparts in ancient Greece it was assumed that technical activity could be unproblematically subsumed under general questions in the realm of the economy and politics (see also Winner, 1995). As discussed below, science and technology takes the (practical) means and society takes the (epistemic) ends. This meant that the kinds of questions and issues that were considered relevant to a discussion of the administration of the state were conceived as irrelevant to technology as the form and content of technology occurred at different times and places to decisions on ends (Feenberg, 1999). Philosophical speculation in relation to technology could therefore be ignored or considered inapplicable because this commonsense concept of *instrumentalism* understood technology as a *neutral phenomenon* with its effects being the outcome of social and political determination.

Instrumentalism is probably the most widely accepted understanding of technology and proposes a commonsense vision of technology as neutral 'tools' or means ready to be used as deemed appropriate. Feenberg (1991) suggests that instrumentalism implies four related claims. First, technology is neutral to the ends it is used and thus only contingently related to the substantive values it serves. Second, modern technology is indifferent to politics in a way that is quite different from 'traditional and religious institutions, which cannot be readily transferred to new social contexts because they are so entwined with other aspects of the societies in which they originate' (Feenberg 1991: 6). Third, the neutrality of technology is associated with its 'rational' character and the 'truth it embodies'. Here technology is premised on known and measurable causal propositions that are not related to social and political decisions: what works in one context can be considered to work in any context.

Fourth, because technology is universal ‘the same standards of measurement can be applied in different settings’ (Feenberg, 1991: 6). An instrumentalist understanding of technology has been a dominant social scientific approach to issues of technological change. Thus the claim of instrumentalism is sustained so long as the means of achieving change remains unproblematically deduced from and subordinated to agreed outcomes and end states—something which, as set out below, substantivists contest.

Technologies began to be understood as *important in themselves* with historicist accounts of progress (that is, large-scale laws). Enlightenment accounts were a constitutive part of the emerging natural and social sciences of the late eighteenth and early nineteenth centuries and helped establish the association of progress with technological determinism (for a commentary see Feenberg, 1999). Technological progress became increasingly entwined with human freedom and happiness whilst premised upon a doctrine that took human experience as the starting point for techno-scientific knowledge. Thus for Hume and other Enlightenment philosophers, ‘the Science of Man is the only solid foundation for the other sciences ... Human Nature is the only science of Man’ (Hamilton, 1992: 37). And as humanity’s faithful delegate, technology could be disassociated from dogmatic accounts associated with religion and myth *and* demarcated from the realm of contemporary social and the political debate. This is what Latour (1993) describes as the ‘work of purification’ that is the ‘constitutional guarantee of the Moderns’. Latour (1993: 29) describes how the spoils of politics and nature are divided between Hobbes and Boyle with the former claiming political science and the latter taking epistemology:

As with any Constitution, this one has to be measured by the guarantees it offers. The natural power that Boyle and his many scientific descendants defined in opposition to Hobbes, the power that allows the mute objects to speak through the intermediary of loyal and disciplined scientific spokespersons, offers a significant guarantee: it is not men who make Nature; Nature has always existed and has always already been there; we are only discovering its secrets. The political power that Hobbes and his many political descendants define in opposition to Boyle has

citizens speak with one voice through the translation and betrayal of a sovereign, who says only what they say. This power offers an equally powerful guarantee: human beings, and only human beings, are the ones who construct society and freely determine their own destiny.

The conjunction of a secular and scientific humanism and a technoscientific determinism meant that technologies could be conceived as the human assembly of mute forces and thus could be understood as serving enduring and collective features of the human condition. Technologies remain neutral objects, which do not interfere with human nature, but over time can be understood as able to reduce the gap between the present and imperfect world and humanity's natural and rational condition—a foundational narrative that is indeed worthy of a Greek play.

2.5 Diverging Accounts of Technological Determinism

Feenberg (1999) argues that the generic scope of technology and its inherently humanistic mandate became reconfigured into two diametrically opposing conclusions during the twentieth century: these can be delineated as the *end of ideology* and *substantivism*. Both these positions can be understood as attempts to resolve increasingly paradoxical and contradictory claims of technological determinism and universal human-centred outcomes from technological innovations. Despite differing conceptions of humanity's place within technological development both the end of ideology and substantivism share the assumption of technological determinism.

The *end of ideology* thesis asserts that there remains a continued separation of the means and ends relationship with regard to technology. This separation of means and ends is, as mentioned above, associated with an instrumentalism that dates back to Aristotle. In the early twentieth century, the term 'technocracy' was coined by the Californian engineer William Henry Smyth, with his proposition that 'technicians should rule' (Bullock et al.,

1988). It was during America's Great Depression years that 'technocracy' became a temporary social movement that posited an alternative to the political system's failures in economic planning.¹ Proponents of the end of ideology thesis asserted that as politics increasingly becomes a branch of science and technology, public discussion and debate can be replaced by professional groups with the technical expertise to make appropriate decisions. This meant relying upon scientific research methods for decision-making rather than uninformed opinion and tradition. Commentators such as Bell (1960), Toffler (1970) and Fukuyama (1992) are examples of more recent and popular accounts that attempt to maintain the optimism of a technocratic future. Such claims on the future remain the basis of ongoing debate about the role and authority of the expert versus the politician in society.

The second conclusion about technology is that rather than being neutral it is *substantive* (see Feenberg, 1991, 1999; Scarbrough and Corbett, 1992: 73-89). Substantivism's claim is precisely that there is a fundamental problem with the progressive and technocratic worldview that denies technology's autonomous cultural force in displacing traditional values (see Ellul, 1964). For substantivists like Ellul the 'technological phenomenon' has become the defining characteristic of modern societies irrespective of political ideology. Here technology is not a neutral entity because means and ends *cannot* be separated. Technologies always embody specific ideological values and thus technologies have a self-existent content and autonomous force. Expressed another way, technology's duality means that it is both a tool for doing particular things *and* a way of conducting everyday activity that often becomes an end in itself.

¹ The adoption of Taylor's (1911) 'neutral' technique of Scientific Management by the state enterprises of the former Soviet Union is a good illustration of how the 'end of ideology' notion traversed the liberal democracies of the West and the planned economies of the Soviet Union during the twentieth century.

Substantivists are often accused of presenting a doomed account of technologies that somehow have magical powers. But to many their claims are readily believable, in part because they accord with a sense of everyday experience. The growth of fast food such as high-street burger chains and ready-made meals can be analysed from a substantivist position (Feenberg, 1991). In many advanced Western economies the 'unity of the family, ritually affirmed each evening, no longer has a comparable locus of expression', says Feenberg (1991: 7-8). This does not mean that technology simply 'causes' the decline in a traditional family structure, although many would argue that it is significant, but that in choosing ready-made meals, fostered by powerful advertising inducements by food companies, cultural choices are made that substantivists would argue constitute a way of living (Feenberg, 1991). An instrumentalist might respond to this, in contrast, by saying that tasty and interesting ready-made meals allow good food without the 'social complications'.

Substantivists' arguments against instrumentalism is that it reduces eating to the 'biological' provision of protein, energy and calories, and so forth, making the cultural expression of eating secondary to a primary biological need. Yet the demarcation and hierarchy of eating fast food as purely a biological-cum-technical operation, as 'fuel for the machine' rather than social expression, is by no means self-evidently known *a priori* or without its own historical and cultural construction. Nonetheless, despite its historical constitution, substantivists would argue that when eating becomes associated with the functional provision (that is with a means to a particular biological end) of energy, eating becomes more easily reducible to a biological maintenance to be achieved efficiently. Henceforth eating can be subjected to technological innovations that make it ever more efficient.

The difference between the end of ideology thesis and substantivism is, then, the contention for the latter that modern technologies do not accord with human needs. For substantivists, rather than moving society towards an increasingly pure expression of what is essential to the human, modern technological innovation in fact brings about the opposite. As value-laden tools, technologies shape human life and become increasingly pervasive in defining humanity according to the techniques embodied in technologies. Technology, for substantivism, thus transforms what it means to be human because how we do things determines what we are. In this sense and in contrast to premodern societies that restrained technological development, modernity's secret essence is that it initiates ever-expanding technological rationality, control and calculability through an ethos of instrumentalism.

Feenberg (1991) argues that, despite their differences, both instrumental and substantive theories of technology share a 'take it or leave it' attitude to the question of technology. He writes that 'on the one hand, if technology is mere instrumentality, indifferent to values, then its design and structure is not an issue in political debate, only the range and efficiency in its application. On the other hand if technology is the vehicle of cultural domination, then we are condemned either to pursue its advance towards utopia or to regress to a more primitive way of life' (Feenberg, 1991: 8).

2.6 Heidegger's Question Concerning Technology and Critical Theory

The tradition of protest against the incursion of substantive technologies into human life has an intellectually diverse history. The calls for a spiritual transformation of the human condition by social critics and artists such as John Ruskin and William Morris and the machine breaking of the Luddites during the Industrial Revolution are well-known examples of the fear for human nature and the 'leave it' attitude associated with much modern technological development (but see Grint and Woolgar, 1997: 39-64). The

transformation of humanity in an increasingly technologically mediated modernity, regardless of political ideology, is also the subject of Heidegger's (1977) famous essay in which he attacks the unilinearity of technology and the rationalisation of society it creates. Heidegger is undoubtedly one of the most influential philosophers of technology of the twentieth century and for Heidegger modern technological development transforms what it means to be human so that humanity is reduced to reproducing the technological culture.

Modern technology is, for Heidegger, a way of 'revealing' the world that is transformed into a set of raw material objects that he describes as a 'standing reserve' or 'standing stock' (Weber, 1996: 72). Put another way, modern technology turns human relations into human *resources* that can be managed more or less efficiently according to a logic of instrumental action. This 'standing reserve', which incorporates humanity into its mechanism, combines and manipulates such that the energy of the world is literally ordered into place (Weber 1996; see Cooper, 1993). The appeal of the substantivist position is considerable exactly because it sets out how technical order is more than the adoption of a particular tool, rather technology structures or 'enframes' everyday life in a more or less 'autonomous' manner.

Heidegger's (1977) example of a silver chalice made by a Greek craftsman and the construction of a dam across the Rhine illustrates how he considers humanity's relationship to technology has changed in terms of rationality and control from a premodern to a modern era (see Feenberg, 1999). The crucial difference between premodern craft and modern technology is that craft provided ontological *openings* but modern technology *causes*. A craftsman brings together elements—i.e., form, matter and finitude—and works to bring out the essence of the materials (Feenberg, 1999: 184). The crafting of a goblet brings together man, nature and gods with the offering. Here the craftsman's work does not challenge nature or the gods, it 'does not goad and drive forth and thus transform it into a mere source

of “energy”, which as such can be extracted and stored’ (Heidegger quoted in Weber, 1996: 68). Modern technology, however, ‘de-worlds’ its materials, nature is not worked or cultivated but placed and entrapped in a placing which dislocates all previously existing forms of ordering. Heidegger illustrates this with the example of a dam:

The hydroelectric plant is not constructed in the current of the Rhine as was the old wooden bridge that joined that bank with bank for hundreds of years. Rather, the river is obstructed, dammed up in the power plant. The river is what it is now, as river, because of the goings-on of the power plant (quoted in Weber, 1996: 68).

Heidegger’s history of the human condition culminates in a totalising ‘technological enframing’ and for those studying technology it also provides an intellectual legacy that is difficult to circumvent precisely because it has been so influential. Any attempt to provide an alternative account of technology, and its relations to humanity, needs therefore to rework the authority—or impasse—of Heidegger’s depiction of technology.

Heidegger’s account of modern technology relies upon a clear distinction between modern and premodern society (cf., Latour, 1993). For Feenberg (1991) this assumption posits two questions. Firstly, is modern society, as Enlightenment philosophers contend, really more ‘rational’ than previous societies? And secondly, can modern society be uniquely characterised, in comparison with previous societies, as one that is dominated by attempts to control? Heidegger’s position is to affirm such a differentiation between the technical, the aesthetic and the ethical of modernity—that is, to treat modern technology as unique and as radically different from the technical activity associated with premodern craftwork. Borgmann (1984) similarly responds to these concerns with a distinction between a ‘two sector’ economy and how a return to craftwork can recover a ‘pre-modern simplicity’ and solve the problem of unemployment. Borgmann’s solution is to place strict boundaries around technology so that simpler forms of life can be recovered. Against this distinction, Feenberg (1991: 9) argues that Borgmann’s distinction is too uncritical and unreflective of

modern technological rationality that Borgmann (1984: 200) credits with 'perfection in every way'. Feenberg questions whether modern technology really is so perfect in its design and implementation. He (1991: 9) suggests that modern technologies are associated with all kinds of breakdowns and disasters that cannot be easily demarcated but 'overflow every boundary and shape the whole framework of social life'.

Feenberg (1991: 9-10) also suggests that this return to simplicity is a kind of cultural or moral conservatism and is problematic in a number of ways. First, defining modern technology's proper place remains contested and this means that it is not easy to agree on what activity should be designated outside of technical mediation. Second, even if demarcating technology's proper sphere were possible, this would foreclose possible future transformations that might be considered desirable. Third, by pitting moral or spiritual simplicity against technology an impotent debate between 'principles versus practicality' is reopened when what is required is an alternative practicality that enhances rather than undermines certain values. Fourth, is it possible to leave some activity untouched by technology or is the very attempt at placing boundaries around technology questionable? For Feenberg, then, the demarcation of a sphere of technology reconstitutes a sterile technological determinism which undermines the potential for transformation of future societies.

In Feenberg's (1991) terms a more productive engagement with Heidegger would be to work through his claim that the essence of modern technology is not technological but the culture of universal control and domination it constitutes. Understanding the problematic of modernity as one of a culture of universal control and domination, rather than as technology *per se*, suggests that an alternative modernity could be achievable through a changing

attitude to technology—what Heidegger describes as a ‘free relation to technology’ (Heidegger, 1966). Feenberg (1991: 14) writes:

The act of choice is technologically embedded and cannot be understood as a free ‘use’ in the sense intended in instrumental theory. However, critical theory denies that ‘modernity’ is exemplified once and for all by the type of atomistic, authoritarian, and consumer oriented culture we enjoy in the West. There is no single ‘technical phenomenon’ that can be characterised and rejected.

It might be argued that this remains an idealist solution where the ambiguities between attitude and the residual role of the technological device remain. It might also be countered by the Heideggarian contention that the modern world has a technological form just as the medieval world had a religious form. Even if the world has a technological form, this ‘technological rationality’ is better understood as a ‘political rationality’, says Feenberg (1991: 14), where the ‘dominant form of technological rationality is neither an ideology (an essentially discursive expression of class interest) nor is it a neutral requirement determined by the “nature” of the technique. Rather it stands at the intersection between ideology and technique where the two come together to control human beings and resources’. Here technology is not so much a pre-ordained destiny as a site of ongoing contestation and struggle in particular social and historical contexts.

2.6.1 Revisiting the Frankfurt School of Critical Theory

The survival of human intervention and agency and how this relates to technology is one of the defining concerns of what is known as the Frankfurt School of Critical Theory (see Feenberg, 1986, 1991, 1999). For Critical Theorists working through the legacy of Heidegger’s philosophy, the central problem that had to be addressed was the contention that as democracy becomes increasingly technocratic, dialogue and debate in the public sphere is replaced by one-way communication from experts that marginalises the public. Responses to this contention take various forms including Lukács ‘reification’, Adorno and

Hockheimer's 'total administration', Habermas's 'technization of the lifeworld' and Marcuse's 'one-dimensionality'. Most generally, all these critical thinkers share something with the Heideggerian claim that technology is *materialised ideology*. There are however substantial differences, although not discussed in detail in this chapter, between Adorno and Hockheimer, Habermas and Marcuse on the form of the ideology, their position on substantivism and their understanding of the relationship between the human and the technological. The general implications can however be delineated into a range of Critical Theory's interests which include attempts to demystify technologies, introduce contingencies to impacts, and make technical and political elites democratically accountable to others, for instance Borgmann (1984), who claims that technology cannot be reformed, the only option in such an impossible situation is to bound the realm of the technological as much as possible and retreat into a world of art, religion or nature (see Feenberg, 1991: 9).²

Weber (1996: 74) argues that despite the claims made by Heidegger and others this retreat does not have to constitute a return into some kind of mythically created past essence. This is because life must simply 'go on' even after the rupture effected by modern technology. In Weber's reading of Heidegger the enabling limits of emplacement arise from the very fact that modern technology does not stop—it is, in fact, technics that can bring about a rethinking of what is essence. Weber (1996: 75) writes:

The alternative to the calculations of technical rationality, to its inability to abide (with) limits, is not, however, simple irrationality. It is rather a certain sensitivity, a certain *coming to ...* But to what? From where? At the least to a mode of thought that can never be reduced to emplacement or comprehended in its terms. In this sense, the goings-on of technics find their truth in the displacements that mark the

² Despite their distinctive approaches, conceptualising technology as ideology has particular political implications which, according to Feenberg (1991: 13), 'with the notable exception of Marcuse, these Marxist critics of technology stop short of actually explaining'. Lukács (1973) account of 'reification' argues that the technical conquest of nature begins with social domination. The human is always and everywhere confronted by social relations congealed as 'things' or 'reifications' that simultaneously internalise and mask the social relations that go into the making of things. An analysis that looks 'beyond things' is particularly pertinent to thinking about technology as it is perhaps considered nowhere more self-evident, particularly in current popular imaginations, that technologies are 'asocial things' or black-boxes with definite boundaries (Feenberg, 1991).

encounter with poetry and with art in general.... Does not the set-up of modern technics disrupt and upset these other settings—those of poetry, art and aesthetics—as well?

Weber's allusion to Heidegger's notion of emplacement as not merely a setting in place—as constituting a static state of affairs—recognises that emplacement can also be a 'dynamical' process which is an inducement to movement, an opening, rather than a closing down (see also Chapter 3 for a discussion of relational effects and reified causes). Such movement, 'goings-on', in Weber's terms, serve to problematise Heidegger's categorical distinction between premodern and modern technology. Rather Weber (1996: 73, emphasis added) reconceptualises this distinction in terms of modern technology's ability to mask the conditions of its own heterogeneity:

But—and this is the irony, or duplicity, of the goings-on of technics as emplacement—there are no secure places. *Emplacement itself remains tributary of that movement of unsecuring that it ostensibly seek to escape or to ignore.* And it is here that the dangerous destiny of technics emerges ... The danger is not technics but its secretive goings-on, and they are secretive inasmuch as they inevitably tend to efface their own heterogeneity.

The implication here is that technology's power is the culture of reified asocial, ahistorical and apolitical 'things' with its 'secretive goings-on' rather than technology *per se*. This may sound like a reassertion of the instrumentalism described previously but Weber's approach provides an argument against positing an invigorated movement of the human and technical purely from a different ideology. In contrast, relations and distinctions between the human and the technical are approached as *coming out of* immanent relationships. This immanent approach, which is developed in detail in the following chapter, is also alluded to by Ihde (1990: 200-2), who states that 'any larger gestalt switch in sensibilities will have to occur from *within* technological cultures'. The challenge that Idhe lays out is whether nature can be de-instrumentalised without returning to a 'spiritualised Luddism' or 'biological animism'? As a starting point Idhe suggests that we think of the human condition as a

technological civilisation that is a ‘kind of biologically activated “geological force”’ from which the human emerges in the first place. Idhe’s remarks open up the ongoing and unresolved materialist and idealist debate in Western Marxist thought and it is this that I now introduce through a discussion of the controversy between Habermas and Marcuse on the relationship between technology, politics and nature.

2.6.2 Transforming Technology and Nature in German Marxism

Habermas’s (1984) approach to modern technology is substantially different from other Critical Theorists mentioned above and it is his depiction of technology that forms the basis for discussion in this section. Heidegger’s invocation of ‘heterogeneous goings-on’ casts radical doubt upon the possibility of creating realms of purely technological and artistic or poetic practice in modern society. Habermas, in contrast, does attempt to sustain a distinction between fact and value—between generic and politically neutral technologies relevant to human interests and the communicative realm of politically biased decisions. According to Habermas, technologies are general and neutral forms of purposive-rational action that correspond to human control and only become distorted when they mix with the communicative sphere. Hence the pathology of modern society in the form of a technisation of the everyday world of communicative interaction occurs with the institutionalisation of particular power relations through knowledge-constitutive interests, based upon success-oriented action and the criteria of efficiency.

Habermas distinguishes between earlier and later periods of technical action by the relative purification of the technical and communicative sphere. This periodisation is reminiscent of Heidegger’s characterisation of premodern and modern technology, but whereas Habermas believes it is still possible to lever apart what can be understood as distinct realms, Weber’s (1996) depiction of Heidegger introduced above would be highly sceptical of the

possibilities of identifying spheres *a priori*. Nonetheless for Habermas (1972) what is important is the instantiation of socially politically effective forms of interaction that can take advantage of scientific and technical know how.

Vogel (1995) suggests that Habermas reintroduces a Lukácsian dualism into Western Marxism by positing the existence of two mutually irreducible types of human action—‘work’ and ‘interaction’. ‘These modes of action are built into the structure of the species as such ... we are necessarily characterised from the beginning by the dual projects of finding ways to provide the physical necessities of life on the one hand and of interacting with our fellow creatures in the communicative practices that make up the social order on the other’ (Vogel, 1995: 27-28, emphasis added). In other words, these dual modes of action, prediction and control of nature *and* mutual understanding, reflect fundamental ‘human interests’.

It is from these trans-historical and trans-social ‘human interests’ that Habermas makes interesting moves in order to set out the differences between the techno-scientific and the social and the political. First, Habermas claims that the objects we claim to know are objects constituted by humans, but, secondly, that these objects which are constituted are done in accordance with the human’s fundamental interests (for more detail see Vogel, 1995). This means, Vogel (1995: 27-30) suggests, that Habermas can claim natural sciences do not investigate ‘reality as such’ but rather the chunk of reality that is relevant to the human’s fundamental interest in prediction and control. Similarly, hermeneutic methods of interpretation investigate a different segment, constituted by the other fundamental human interest in mutual and shared understanding. Vogel (1995: 28) writes that this means:

Habermas is able to reject the positivist identification of natural scientific knowledge with knowledge *as such* without at the same time leaving the undeniably successful natural sciences without any epistemological justification at all.... Science is not, on this view, the ideological reflection of a social order based on

domination, but rather *simply the most recent form of a practice and a knowledge that have been characteristic of all human societies* from the start (emphasis added). The implications of this position is that relations based upon power and domination can be *reversed* through the provision of and adherence to guidelines for communicative rationality and action—ideal speech acts in which such distortions can be avoided and due process can occur—says Habermas (see Willmott, 2003). ‘Domination’ and ‘liberation’ are, for Habermas, only relevant to relations between *subjects*—that is, in a realm of ‘interaction’. Nature, by contrast, is not a subject but an *object* constituted in the realm of ‘work’ that is interested in prediction and control. In order to maintain the sphere of ‘interaction’ Habermas (1987) argues that the Enlightenment ideal of fairness is required in all realms distorted by power and domination and this is achievable through a public space in which all utterances are subject to criticisable validity claims. *Contra* Heidegger, for whom modernity is a simultaneous expression of technological form and technological rationality, Habermas contends modernity can be salvaged through the delineation of political rationality *applied to* rather than emerging out of technological devices. The problem with this argument according to Vogel is that it tends to re-invoke the instrumentalist versus substantivist debate mentioned above and has relatively little to say about technology itself. More importantly, it re-instates an uncritical acceptance of positivism’s natural science method where ‘a natural scientist engages in the solitary observation of “data”, with the intention of developing a “theory” that will both explain the observed “facts” and allow future ones to be predicted’ (Vogel, 1995: 30). Here technoscience is interested, in accordance with the human’s fundamental interests in prediction and control, but not *too* interested or subject to any specific social interests.

It has been suggested that Habermas’s (1972) criticisms of other Critical Theorists are based upon understanding the essence of technology as a trans-historical form of purposive-

rational action rather than bound up with some particular social and historical context. The assertion of neutrality means that, unlike Marcuse who argues that the very essence of technology is at stake, Habermas's position makes it difficult to provide a critical account of the social dimensions of technology. Vogel (1995) argues that this means that Habermas's position becomes an increasingly paradoxical one. Thus Habermas draws on Marcuse's thesis of 'one-dimensionality' and elaborates a 'colonisation thesis' in relation to the extension of technical ways of thinking and acting into the lifeworld, whilst simultaneously remaining unable to give any thoroughgoing analytical consideration to technology because it remains neutral. This leads to an acknowledgement that values, rather than science, establish the use of equivalent technologies such that Habermas (1972) states social and political preoccupations determine the direction and purpose technological advances while *also* contending a general and ahistorical character of technology.

Marcuse argues that the idea that technology is neutral and ahistorical can be readily associated with naïve and simplistic instrumentalism or neutrality and is a particular kind of ideological illusion (see Vogel, 1995). Habermas's assertion of the neutrality of the technological sphere is premised upon abstractions—ideal types—from actual practices and application. Maintaining an abstract and theoretical division between techno-scientific and communicative rationalisation remains vital for Habermas even though he concedes that the practices and applications are complex 'mixtures' that do not correspond to pure ideal types. It is in relation to the status of these mixtures that Marcuse would have charged Habermas with confusingly separating purely technical principles with concrete social realities. In Marcuse's terms, it makes no sense to understand technological development outside of the historical processes through which technical principles come into existence (Vogel, 1995). This means that practices cannot be understood as resulting from abstract principles, rather principles are incorporated into technologies in as much as they are

embodied in particular technical devices. In other words, the mixture of the technical and social realm is not extrinsic, *a priori* or necessary but determinate and contingent for both techno-scientific and social realms.

Marcuse (1964) takes up the possibility of a society free from the distortions of power and domination but from the position that technology must be understood as also a social and historical endeavour. It has been mentioned above that, according to Vogel (1995), Habermas's position is part of ongoing and deeply held differences in Western Marxism. For Vogel (1995: 23) '[t]he tradition of German Western Marxism has had a problem about nature from the beginning', and unlike Orthodox Marxism, which considered nature and society as available to scientific methods, German Marxism rejected this view but did not resolve the question of what Marxist theory should take as nature and what should be the status of scientific investigation. It is from this that Vogel suggests that two opposing and irreconcilable positions have been in dispute ever since (for a discussion in relation to organisational analysis see Burrell and Morgan, 1979).

The first position asserts that Marxism is a social theory rather than a theory of nature. The suggestion here is that natural phenomena can be investigated and contemporary natural science offers a non-ideological method to do this. The problem is not with science *per se* but with the misapplication of science to social questions (see Flyvbjerg, 2001). On this Lukács (1973: 10) writes that when scientific knowledge is focused on nature 'it simply furthers the progress of science, but when it is applied to society it turns out to be an ideological weapon of the bourgeoisie'. Against this position, Marcuse argues that nature is a 'social category' and this means insisting 'on the constitutive role of the (social) subject in the object of its knowledge, and so rejects the objectification that underlies contemporary natural science as a symptom of reification' (Vogel, 1995: 23). By treating the external

world as already constituted and as ready-and-waiting for instrumental manipulation, science and technology deny the role of the social, historical and political in the construction of the natural.

Marcuse, like Heidegger, similarly placed technology at the centre of his analysis with a defence of the 'classical Frankfurt School position' that associated contemporary technology with the domination of nature. By contrast, Habermas's reworking of Lukács, which downgraded Marcuse's account of domination of nature through technology, placed all emphasis on political rationality. For Marcuse and others associated with the Frankfurt School except Habermas, technology is materialised ideology and this has the effect of subordinating human potential to technological imperatives. Marcuse and Habermas contend that this domination through technology can be overcome through human intervention, but unlike Habermas, Marcuse demands a complete and 'Absolute Refusal' of one-dimensional society. Such a radical and utopian transformation of society, achieved through changing the structure of technological rationality, can be accomplished through invoking a new type of reason premised upon the abolition of class society and its associated performance principle. In such an environment technological rationality would be benign and work in harmony with 'if not an original unity of man and nature, at least the existence of natural forces congruent with human needs' (Feenberg 1999: 153). A basic transformation of technological practices can be brought about harmonising humanity's relationship to nature, that is to say, by treating nature as another subject, rather than merely a raw material ready-made object 'out there'.³ Marcuse (1969: 19, quoted in Vogel, 1995) states that:

³ Feenberg (1999) makes the point that this subject should not be understood as an essentialised subject, but rather a field of possibilities. Feenberg (1999: 156) states that 'Marcuse does advocate relating to nature as another subject, but the concept of subjectivity implied here owes more to Aristotelian substance than to the idea of personhood. He does not recommend chatting with nature but, rather, recognizing it as possessing

Freedom indeed depends largely on technical progress, on the advancement of science. But this fact easily obscures the essential precondition: in order to become vehicles of freedom, science and technology have to change their present direction and goals; they would have to be reconstructed in accord with a new sensibility—the demands of the life instincts. Then one could speak of a technology of liberation, a product of scientific imagination free to project and design the forms of a human universe without exploitation and toil.

Marcuse writes in another publication (1964: 166-7, quoted in Vogel) that science:

has projected and promoted a universe in which domination of nature has remained linked to the domination of man.... change in the direction of progress, which might sever this fatal link, would also affect the very structure of science—the scientific project.... science would arrive at essentially different concepts of nature and establish essentially different facts.

In these utopian passages the domination of nature is the domination of 'man' and is reworked into a new sensibility that does not treat nature as something to be controlled and manipulated. In Marcuse's formulation, nature would become a subject in its own right—that is to say, 'a subject with which to live in a common human universe' (Marcuse, 1972: 60; see also Latour, 1993). This would result in a 'reconstruction of reality', says Marcuse—a new method, new results and literally a new world that transforms nature in the interest of the liberation of both 'man' and nature. Here nature changes when society does and in doing so new and different facts are created.

Habermas's position is in opposition to what he understands as Marcuse's 'out-and-out idealist myth' about technology and the possibility of a reconfigured sensibility between a new humanity and a new nature (Vogel, 1995). Marcuse would have resisted Habermas's contention that such statements are anthropomorphic (i.e., nature is a human kind), but it is useful to quote Heidegger to illustrate the similarities between Heidegger's and Marcuse's positions on phenomenological experience. Heidegger (1971: 154) writes about the

potentialities of its own with a certain inherent legitimacy. That recognition should be incorporated into the very structure of technological rationality'.

constitution of a particular location and how this location does not exist before the construction of a bridge:

Before the bridge stands, there are of course many spots along the stream that can be occupied by something. One of them proves to be the location, and does so because of the bridge. Thus the bridge does not come first to a location to stand in it; rather a location comes into existence only by virtue of the bridge.

Heidegger's point is that the typically modern distinctions between nature and culture, between subject and object, block our understanding of the 'world' as a phenomenologically constituted reality. Despite political disagreements with Heidegger on issues such as the importance of delimiting the technological realm, Marcuse would, with overtones of Heidegger, express our intimate connection to nature, not as an abstract and objective distinction, but as a series of participatory life process acts in which nature simultaneously belongs to history *and* is a source of social meaning (see also Vogel, 1995). Such an understanding of humanity's relationship to nature would not mean, and as Habermas claims, that humanity returns to a teleological nature philosophy, rather it would require the adoption of a different position which recognises humanity as a subject of technical action.

It has been suggested that for Marcuse techno-scientific practice is always a historical project—it 'constitutes a world'. Yet for all Marcuse's writing on the 'new approach to nature', a 'new science' and 'new technology', he also 'constantly speaks of something like a noumenal nature, a nature in it that previous technology has repressed and that the new one will somehow free' (Vogel, 1995: 34). Modern technologies as modes of domination 'offend against certain objective *qualities* of nature.... The emancipation of man involves the recognition of ... truth in things, in nature', writes Marcuse; nature is described as a '*recollection*:... the rediscovery of the true Forms of things, distorted and denied in the established reality' evoking the liberation of nature with a return to a form of Platonic

remembering where 'nature's *own* gratifying forces and qualities are recovered and released' (Marcuse, 1972: 62-69, quoted in Vogel, 1995). Here Marcuse, like Habermas, introduces a dualism between the natural-and-biological and the social-and-historical. The difference between Habermas and Marcuse being that Habermas's pre-existing nature is there from the *beginning* of the human condition and for Marcuse nature-as-it-really-is appears *after* a social revolution. Both Habermas and Marcuse, then, invoke divisions between the socio-cultural and bio-natural but do so in different ways, at different times.

Vogel (1995) makes a cogent argument that it is not in fact the active production of knowledge that Marcuse's 'new science' emphasises but rather its *receptive* or ahistorical character. This 'ability to see things in their own right' (Marcuse 1972: 74) is a deep-running ambiguity in Marcuse's philosophy, says Vogel (1995: 36), so much so that 'a romantic yearning for passivity ... for delicious surrender to the powers of nature' undermines his entire intellectual project. This results, ultimately, in a return to biologism or naturalism that has been repressed by civilisation—'a biological foundation for socialism' (Marcuse, 1969: 7)—where the historical constitution of nature is betrayed by revolutionary action that turns into a natural or biological impulse. Nature is constructed in such a way that it is 'let be' and thus ethical questions concerning a new society finally become biological or naturalist questions. The struggle 'is not a question of choice; the protest and refusal are parts of their metabolism', says Marcuse (1969: 63).

The motivation for both Habermas and Marcuse's ahistorical nature is, according to Vogel (1995: 37), a fear of relativism where 'it does not seem possible to justify criticism of a social order that admittedly "delivers the goods" and apparently satisfies most people's needs'. The problem of relativism is connected to the general debate in Western Marxism that was introduced above and discussed in terms of Habermas and Marcuse. Vogel (1995)

suggests this reveals the shortcomings of Habermas's *a priori* nature and Marcuse's *ex post* nature to 'let it be', but also demonstrates what might be right about both. Vogel (1995: 38, emphasis in original) writes:

Habermas's emphasis on the role of human interest in our knowledge of nature shows that nature is *not* itself a subject, rather being the object of our constitutive acts.... For just this reason, however, something like Marcuse's New Science is possible: a new social order would mean a new mode of action, and would bring with it a new world (and even—as post-empiricism makes clear—'new facts').

For Vogel one productive way through and beyond the dualism between idealism and materialism is by asserting the qualitative difference between the human subject or collective unaware of the ways that practices constitute certain realities and a human collective that is aware. An interested rather than disinterested or 'neutral' technoscience would bring about Marcuse's 'new science' where the illusion of neutrality 'is punctured, and humans self-consciously and explicitly assert their responsibility for the world, transforming it on the basis of needs that are discursively expressed and social decisions that are democratically made.... [and thus, finally] science would know itself as an instrument of liberation—not silent nature's, but our own' (Vogel, 1995: 39). Vogel depicts a human collective that uses science as an instrument of 'our own' liberation through a practice of experimentation, an approach that is discussed in more detail in the following chapter.

2.7 Sociological Studies and the Social Construction of Technology

Like Critical Theories of technology, the relationship between organisation, technology and the human condition is also the concern of social studies of technology. Studies in the social construction of technology (known as SCOT) are interested in the social content that constitutes the 'interpretative flexibility' of technological devices (see, for instance, Pinch and Bijker, 1984; Bijker et al.; 1987, Bijker and Law 1992; MacKenzie and Wajcman,

1985; Grint and Woolgar, 1997). Within SCOT, McLoughlin (1999) delineates a 'working outward' as an internalist approach that focuses upon the shaping of technologies within scientific and technical communities and a 'working inward' as an externalist approach that focuses on forces beyond scientific and technical groups (see McLoughlin, 1999: 123-40; see also Sismondo, 2004).

Interest in social construction from the late sixties onwards stems in large part from Berger and Luckmann's (1966) book in which they set out 'society as objective reality', which is composed of institutions, and, 'society as subjective reality', which is concerned with socialisation and institutionalisation (Sismondo, 1996: 50-58). A related strand of constructionism developed during the 1970s with researchers at Edinburgh setting out what became known as the 'strong programme' (Bloor, 1976) to the sociology of scientific knowledge (SSK). This also provided an analytical basis for SCOT research from the mid-1980s, with early strong programme studies associated with an externalist approach to science and technology (Sismondo, 2004). Hess (1997: 86) summarises the principles of the strong programme as concerned with:

1. causality: social studies of science would explain beliefs or states of knowledge;
2. impartiality: SSK would be impartial with respect to truth or falsity, rationality or irrationality, or success or failure of knowledge (and, presumably, technology);
3. symmetry: the same types of cause would explain true and false beliefs (in other words, one would not explain 'true' science by referring it to nature and 'false' science by referring it to society);
4. reflexivity: the same explanations that apply to science would also apply to social studies of science.

Bloor's version of symmetry 'argued against the then prevalent notion that scientific knowledge was the result simply of unaided human rationality and causal input from the material world' (MacKenzie and Wajcman, 1999: 21). For Bloor, a sociological analysis is appropriate to explain all knowledge. In this sense successful technological impacts as well

as failures became understood as requiring socio-cultural explanation. Hess (1997) suggests that the principles of impartiality and symmetry have been the most important and controversial contributions to social studies of science and technology. Hess quotes Bijker (1993) and Woolgar (1992), for example, who argue that the extension of symmetry has been the defining feature these sociological approaches. This has included an extension

from Merton's symmetry between science and other social institutions to Bloor's symmetry in the treatment of true and false knowledge to later developments that argue for symmetry between science and technology, the analyst and the analysed, humans and machines, and the social and the technical (Hess, 1997: 87).

The analytical focus of SSK and SCOT studies often centred on controversies and ambiguities as a way of recovering the processes of success or failure. The way in which controversies are resolved, who wins the argument and who loses, is crucial because such resolutions would have a tremendous influence on future directions and implications for those working with a particular technology but also, depending on the technology, the public more generally. This interest in the social construction of technology is, as McLoughlin (1999: 90) describes it, a shift 'from considering the individual inventor as the key explanatory concept in technological innovation ... in particular linear/rational models of the process of technological development' (Bijker et al., 1987: 3).

With this SCOT approach it was not just the adoption and use of technologies that was amenable to social research but also the design and content of technologies. The congealing of technological design and content, Bijker and Law (1992) argue, is made up 'trade-offs and compromises' such that the line between the technical and the social is the result of contingent social negotiations (McLoughlin 1999: 91). The implication of this position is that the resulting technology, what is termed 'closure' or 'black-boxing', can be best analysed as the resolution of conflicts and controversies between powerful social groups rather than through consensus or technical superiority.

In explaining technological development and closure SCOT-inspired research adopts what is termed 'interpretative flexibility'. This denotes the ways in which social groups have different positions on a range of future alternatives for a particular technology, and mobilise particular rhetorical strategies to secure closure around a technology's function, and its subsequent development and use. In these studies the focus is, then, on the struggles between various actors—including for instance, professional associations, companies, trade unions, research funding bodies, to name a few—in the development of and closure around what a particular technology is constructed to be. Unlike laboratory studies of science discussed in the next section, which Pinch and Bijker (1984: 431) suggest have a too narrow focus to be relevant to the study of technology, SCOT researchers focus on a range of social groups. Here technologies are 'successful' because they have been configured over time for particular uses by dominant social groups. It is this multi-directional approach to technological innovation and change according to Pinch and Bijker (1984: 411) that is

in contrast with linear models used explicitly in many innovation studies, and implicitly in much history of technology.... Of course, with historical hindsight, it is possible to collapse the multi-directional model onto a simpler linear model; but this misses the thrust of our argument that the 'successful' stages in the development are not the only possible ones.

Pinch and Bijker (1984) provide the classic study of interpretative flexibility, closure and black-boxing with the empirical example of the nineteenth century bicycle. They (1984: 414) describe a number of relevant social groups, with social groups defined as individuals, organised and unorganised groups, organisations and institutions. Each social group shares some interest in the bicycle and each group attaches particular meaning to the bicycle. Differing assumptions and expectations are termed the social groups' 'technological frame' (Bijker, 1995). For Pinch and Bijker, this notion of 'technological frame' describes two elements of the relations between social groups and technology. First, different social groups constitute technologies through the meanings they attach to them. Closure is a social

interaction that occurs through the negotiation of meaning between relevant social groups as to the use of the technology and the problems it solves. Second, technologies are stabilised (or not) through meanings and in this way they have meanings for social groups because technologies help to define users in particular ways. They describe how young men, for example, considered the bicycle a racing device, whereas for young women the bicycle caused problems because of women's long dresses, and for older men it was associated with the risk of falling off. Each social group interprets different problems (i.e., speed, fashion and safety) in different ways and thus proposes different solutions. The twentieth century bicycle became a safe bicycle and whilst this might appear as the inevitable result of previous bicycle designs, for Pinch and Bijker the safety bicycle did not become the standard design purely because of its essential characteristics.

The approach that SCOT researchers provide is one that foregrounds the interpretative and negotiated acts associated with technological designs and use. In Pinch and Bijker's example of the safety bicycle this negotiation continues for nineteen years between 1879-1898 in which the safety bicycle, invented in 1884, was at that point one bicycle amongst others. As more powerful social groups begin to dominate and stabilise the legitimacy of their particular definition of problems and solutions the safety bicycle is taken for granted as comprising of a low-wheeled, rear-chain, diamond frame device with air tyres. In Pinch and Bijker's approach, an established and consolidated technological frame is used as the explanatory basis for a lack of interpretative flexibility and how technologies appear to determine other actions in particular contexts. Put another way, technological determinism only makes sense in particular social and historical contexts and social determinism is only viable in specific material contexts.

Grint and Woolgar (1997) have gone furthest in extending and radicalising the anti-essentialism of SCOT and in doing this they have extended and criticised the distinction between subjective and objective realities set out by Berger and Luckmann (1966) and Pinch and Bijker's relatively uncontroversial but mundane claim that different groups interpret technologies in different ways (see Sismondo, 1996). Grint and Woolgar argue that the social construction of a technology cannot be separated out from the objective characteristics of a technology. They pursue the anti-essentialist perspective through the use of the metaphor of 'technology as text'. This approach, which Sismondo (1996) terms 'neo-Kantian', remains continually sceptical of attempts to assign interests or causality to particular actors. The proper analytical task is rather to be interested in the way dichotomies between social actors, natural and technical objects are constructed in the first place and sustained over time and space (see Brigham, 2000). For the critics of Grint and Woolgar's strong social constructivism, this version of constructivism is socially deterministic because it ignores any possibility of analysing the materiality of technologies and the constraints these impose on particular groups' interpretative flexibility (see Hutchby, 2000, for example; see also Kling, 1992). The counter-argument to this is that without such a radicalised constructionist approach, constructionist accounts, which examine how particular problems are worked up, become very prone to be conjoined with a realist account, in which some parts of a social or political system are taken for granted. Woolgar and Pawluch (1985) term this 'ontological gerrymandering'. This denotes the constructionist focus on certain interests with a neglect or taken for granted assumption of other interests:

the successful social problems explanation depends upon making problematic the truth status of certain states of affairs selected for analysis and explanation, while backgrounding or minimising the possibility that the same problems apply to the assumptions upon which the analysis depends (Woolgar and Pawluch, 1985: 216, quoted in Potter, 1996: 184).

There are other criticisms of SCOT that are important to mention briefly. Firstly, that detailed micro-sociological studies of the social constitution of technologies development say relatively little on wider social and political issues. For example, Bijker (1995: 46) suggests that 'we can identify what social groups are relevant to a specific artefact by noting all social groups mentioned in relation to that artefact in historical documents'. The critics of this methodological assumption argue that the conflation of invisibility of particular groups or issues with unimportance for technological development is politically conservative. Those critical of this emphasis on particular social groups suggest that, if this were the case, gender would be irrelevant to the development of a technology if it were not explicitly mentioned during an innovation or configuration process. Secondly, micro-studies provide a weak foundation for intervention or activism. Hess (1997: 88) argues this is because Bloor's symmetrical analysis of controversies tends to be captured by the 'out-group' for two reasons. Firstly, 'an epistemologically symmetrical analysis of a controversy is almost always more useful to the side with less scientific credibility and cognitive authority', and, secondly, 'the side with fewer scientifically or socially credentialised resources is more likely to attempt to enrol the researcher'.

The third criticism relates to the specificity of actor-network theory's object of study, namely the role of technoscience in society. For Latour (1993) technoscience is interesting because it is different from other cosmologies (for a discussion see Seguin, 2000): it is involved in the making of new technoscientific realities based around producing the dualism between nature and culture. Seguin (2000: 504, emphasis added) argues that 'Latour's approach marks a shift from the social determinants of scientific knowledge to the *ontological labour* performed by scientific activity', and this means that for Latour this sets out an interest in the ontological constitution of technoscience rather than the social determination of science or technology. Seguin argues that this means that those who

deploy SCOT and SSK methodological assumptions and techniques do not share the same object of study as actor-network theorists. The sociology of scientific knowledge is interested in unmasking the social interests that prefigure scientific knowledge, that is to say, it is interested in society *in* science. In contrast, Seguin (2000: 505) argues that 'Latour is trying to theorise the social function exerted by science. His object of study is therefore "science in society"'. She (2000: 505) continues, quoting Latour and Callon (1992: 348): 'We have never been interested in giving a social explanation of anything, we want to explain society ...'. Like the Critical Theorists before him, Latour is interested in analysing the central and original role played by technoscience in contemporary society. Latour (1993) does this by following the scientists in their laboratories and field sites in order to evoke the activity of making variable ontologies into stabilised ontological entities.

2.8 Actor-Networks, Laboratories and Technoscience

Latour and Woolgar's (1979) anthropologically inspired study of the laborious, meticulous and routine work of a scientific laboratory challenged the positivist theory and philosophy of science. In a positive account of science, knowledge is produced, critically engaged with by relevant scientific elites and evidence that stands up to scrutiny is disseminated through academic and professional output (see Merton, 1973, for example). Latour and Woolgar's book helped challenge this rationalist and cumulative account of scientific knowledge, although, importantly, they were not the first to interrogate the production and status of scientific knowledge.

Kuhn (1962) is perhaps most famously associated with problematising positive science, arguing against the then dominant conception of scientific knowledge as progressive, cumulative and linear. In contrast to the positive view, Kuhn argued that science is produced by dominant scientific communities in particular localities and within a situated

Weltanschauung that is more like a political community than a dispassionate elite (see also Burrell and Morgan (1979) for an influential use of Kuhn's ideas in organisation analysis). This paradigmatic or 'conventionalist philosophy', says Hassard and Keleman (2002: 335), presents knowledge production as 'the result of scientific "wars" in which "Old Guards" are recurrently overthrown by bands of "Young Turks".... Scientific practice reflects the irrational forces of consensus, dogma and belief'. Here scientific progress occurs through oscillating periods of 'normal' and 'revolutionary' science 'rather than by (scientific) giants standing on another's shoulders'.

One of the major contributions to the study of science that Latour and Woolgar made was in providing a detailed account of the practices of scientific fact-making in the laboratory. Latour and Woolgar's contention is that theorising of how science should be conducted did not examine the nitty-gritty workings of science: that is, the *work of making* scientific facts universal. Throughout the 1970s sociological accounts of scientific knowledge began to challenge the assumptions of philosophers of science, rendering scientific facts situational, provisional and political. Before these 'laboratory studies' and, in part, as a legacy of the Aristotelian intellectual hierarchy outlined at the start of the chapter, scientific facts had been largely attributed an *a priori* universality in both status and applicability and the study of the universality of facts was considered largely irrelevant. The particular contribution that Latour and Woolgar helped instantiate, along with those in the sociology of scientific knowledge, was an analysis of science 'in the wild' (Hutchins, 1996) as the construction and stabilisation of 'heterogeneous technoscientific networks' where facts become facts through immutable mobility over times and spaces.

It is in this sense that Latour's injunction 'we follow science in action' posed a series of questions for the study of science, but also parallel questions for the social study of

technological innovation. It is worth setting out three such questions and elaborating actor-network theory on each. First, how do scientific facts or technological innovations ('technoscience' for ANT) become universal; that is, how do scientific facts or technologies move from being local uncertainties—in the laboratory or design centre, for instance—to having global reach? Second, how are definitions such as universal-local, social-technical and natural-artificial distinguished, legitimated and consolidated? Third, what is the relationship between actors given a symmetrical approach to human and non-human actors (sometimes referred to as actants) and what does it mean to eschew conventional distinctions between human subjects and non-human objects?

2.8.1 From Local Uncertainties to Contingent Universal Certainty

How do facts (from the Latin *factum* from *facere* meaning to do or make; in the OED an 'action, a deed; especially a noble or brave action, an exploit, a feat') become universal? How does a local network pass from a state of flux and uncertainty to an irreversible, standardised and immutable network? In Latour's terms it is the work of mediators and purification (that is, a variable ontology) granted to all actors, discussed in more detail in section 2.8.3, that 'registers the variations in the stability of entities from event to essence' (Latour, 1993: 85). This means following the trajectory of actors through a longitude (that is, the degree of purification between natural and social, for instance) *and* a latitude (that is, the degree of stabilisation from event to essence):

The great masses of Nature and Society can be compared to the cooled-down continents of plate tectonics. If we want to understand their movement, we have to go down into those searing rifts where the magna erupts and on the basis of this eruption are produced.... Like the geophysicians, we have to go down and approach the places where the mixtures are made that will become—but only much later—aspects of Nature or of the Social. Is it too much to ask of our discussions that from now on we should spell out the latitude of the entities we are talking about as well as their longitude, and that we should view essences as events and trajectories? (Latour, 1993: 87).

In early ANT studies the scientists' laboratory was a critical locus of research for those interested in following the trajectory of variable ontologies: it meant following scientists, their inscriptions and practices, with the laboratory understood as a multiplicity of devices, concepts, inscriptions and actors that includes laboratory equipment, materials, lab assistants and incorporated skills, but also 'transscientific fields' (Knorr-Cetina, 1981: 81) such as equipment suppliers, funding bodies and research administrators. The *OED* defines a 'laboratory' (from the medieval Latin is *laboratorium* and the Latin *laborat* which stems from *laborare* meaning 'labour', work and activity) as 'a room or building set aside and equipped for scientific experiments or research, or for teaching science, or the development of chemical or medicinal products'.

Latour's (1988) highly influential study of Louis Pasteur is the definitive portrayal of a scientific laboratory in action. In vivid detail Latour sets out Pasteur's attempts in the 1880s to find a solution to a deadly bacterium affecting the French cattle market. Latour's narrative sets up the enterprising Pasteur as a 'system builder' (Hughes, 1986) or 'heterogeneous engineer' (Law, 1992) that conquers the anthrax bacillus afflicting cattle and in doing so undoes the conventional division between the local and the universal and between internal organisation (Parisian laboratory) and external environment (French farm and countryside).

Latour's study of Pasteur focuses upon the translations that occur in the construction of a scientific solution to the anthrax bacteria affecting the French cattle. Latour (1986: 267) describes translation as 'the spread in time and space of anything—claims, artefacts, goods—in the hands of people; each of these may act in many different ways ... modifying it, or deflecting it, or betraying it, or adding to it, or appropriating it'. Translations or displacements turn actors into someone or something else: 'translation', means most

generally 'A' translates the interests of 'B', or asserts of a definition of something. Here neither subjects nor objects are *a priori* complete or arbitrary multiplicities, but are relational effects that 'gain their ontological character through the position they occupy within the translated relations' within practices of mediation and purification (Brown et al., 2001: 129).

Callon (1986) sets out four 'moments of translation': i) problematisation, ii) interressement, iii) enrolment, and, iv) mobilisation (see Mort, 2002), with each of the four 'moments of translation' made up of two related elements. The first is that A is involved in imputing 'certain interests, projects, desires, strategies, reflexes or afterthoughts' to B (Callon, 1992: 81). 'He who is able to translate others' interests into his own language carries the day', writes Latour (1999b: 259). Although A decides this it does not denote total control by A because 'what A does or proposes is consequent to a whole series of intertwining translation operations' (Callon, 1992: 81). Continuing the example, translating B means simultaneously translating, for example, C, D and E and what B is depends on relations with C, D, E, and so on. The second moment is that translation is always inscribed in intermediaries and this means that translation involves A, B and an intermediary. In fact it makes little sense, says Callon, to posit translation as a general term when translation always occurs through intermediaries. Intermediaries are defined as whatever moves between, in this instance, A and B, and intermediaries themselves are heterogeneous networks: intermediaries can be equally well round-table discussions, public declarations, texts, technical objects, incorporated skills or money (Callon, 1992: 82).

Latour's (1988, 1999b, see also Cooper, 1992) study of Pasteur begins in 1881 with the widespread coverage of Pasteur's work in French popular and scientific press at the École Normale Supérieure. At the time Pasteur had begun to study the anthrax bacillus the disease

was causing havoc in the French cattle industry. The first moment of translation occurs when the anthrax disease is *problematized* (i.e., posing a problematic and a potential solution) as something that is amenable to specific scientific investigation, although at this point the anthrax disease is unpredictable and this makes it difficult for existing scientific practice to study it. As Latour (1999b) explains, Pasteur's efforts in the laboratory⁴ remains crucial for constructing a heterogeneous network and *obligatory passage point* of microbes, cattle, farmers and vets, but Pasteur does something novel: he takes the laboratory to a farm in Beauce in the French countryside—a world outside the laboratory. At this point there is still little in common between lab and farm, but Pasteur contacts farmers and vets, talks to them about their problems and the bacteria and sees how it affects cattle. He sets up a temporary lab on the farm and begins the translation of local farm conditions into his own scientific terms. Interests—or *interressment*—are being constructed between actors and so Pasteur begins elaborating a potential link between the laboratory and a cure for the anthrax disease in French farms. As Pasteur translates the disease into his own terms, working on microbes becomes working on the conditions on the farm (see Latour, 1988).

In order to *enrol* (that is, define and distribute roles) farmers in a scientific solution to the problem blighting them, Pasteur must also successfully enrol the disease and he does this by cultivating microbes. Pasteur then returns to his Parisian laboratory with one element: the cultivated bacillus, that is, he translates the problem of dying cattle into something else through the intermediary of the cultivated bacteria. 'With the microbe ... he also draws along with him the now interested agricultural societies' (Latour, 1999b: 260). Farmers are unable to see the cause of their problem on farms, but in his Parisian laboratory Pasteur can turn invisible forces into visible ones. Making the bacillus visible under a microscope is

⁴ Latour and Woolgar (1979: 77-79) distinguish between five types of facts from speculations to common knowledge. Taken for granted facts are made through the deletion of 'modalities' that is 'black boxing'.

critical for Pasteur because he can now simulate, chart and record anthrax outbreaks: the disease is there in the laboratory. Pasteur's work culminates in a 'eureka' moment, that is, that cattle are dying from anthrax microbes.

The cultivation of microbes in the laboratory and the control of microbes' activity that Pasteur is able to demonstrate constitute new forms of practical knowledge (Latour, 1999b: 261). Now microbes can be manipulated and their virulence controlled and farmers have to consider going through Pasteur and his laboratory to solve their cattle problem. The power over the anthrax microbe that Pasteur is able to display with the anthrax vaccine can however only make him powerful vis-à-vis farmers and the wider community if his laboratory practices are set up and followed 'in the field'. The fourth moment of translation, mobilisation of allies, demands that Pasteur reproduce his power outside the walls of the laboratory with a few faithful intermediaries: techniques for the application, timing and recording of disinfection and inoculation. In conjunction with the agricultural societies and with media coverage, he returns to a farm in the village of Pouilly le Fort and sets up what would become a famous field trial to do just this. The farmers become Pasteur's willing community of experimenters—a mobilisation of allies—and his inoculation equipment—non-human allies—creates a course action against which the farmers begin to judge themselves (Latour, 1999b). With the precise and devolved reconstitution of the laboratory at the farm brought about by new equipment and techniques of cattle management, farmers, trained in new competencies and with new skills, are able to invoke Pasteur's power and vaccinate cattle on their own farms so long as they get a vaccine from Pasteur's lab and follow his instructions.

Latour's (1988, 1999, 1999a, 1999b) study of Pasteur demonstrates three key elements of actor-network theory. First, that locally produced scientific facts—that is, in Pasteur's lab—

are only facts when moved somewhere else. They remain intact, that is to say, they are inscribed in immutable mobiles that can travel faithfully and reproduce the same effects over time and space. To paraphrase Latour's well-known formulation: 'there is no equivalence without the work of making equivalent'. This process of black-boxing (the anthrax vaccine in a flask, for example) makes previous translations predictable and delimits potential divergence from Pasteur's network of actors. Scientific facts thus not only have to fit into the local context, whether this is the next scientist's laboratory or a countryside farm, but the setting up of both facts and context is rather an effect achieved by configured chains of actor-networks.

The move to extend from the local to the global is achieved through an array of stabilising devices for inoculating, documents for charting and recording, and detailed instructions for farmers (see Law 1986); in other words, the pasteurisation of France is possible because the network is local at all points. The implications of this for rethinking relations between the local and global are significant, not least because Latour problematises the ability to act at a distance. In ANT terms there is, critically, *long distance control* but no action at a distance—there are only a chain of transformations in which some things are lost and some things are gained over places and times. This is what Latour (1999b) calls a 'displaced achievement' for which inscription devices are significant in making things hold together (see also Latour and Woolgar, 1979: 51). Writing about participant field research observation of scientists studying the border between the Amazonian forest and the savannah, Latour (1999: 69-71) states that in each stage of conducting the research 'stage by stage, we lost locality, particularity, materiality, multiplicity, and continuity such that, in the end, there was scarcely anything left but a few leaves of paper.... we have also gained or regained ... much greater compatibility, standardisation, text, calculation, circulation, and

relative universality, such that by the end, inside the field report, we hold not only all of Boa Vista (to which we can return), but an explanation of its dynamic’.

Second, actor-network theory contributes to problematising the ‘diffusion model’ of technoscientific innovation in the same way it questions the universality of scientific facts. In simple terms the diffusion model makes the assumption that technological innovations emerge from the laboratory ‘fully-formed’ and that adoption requires little more than communicating the benefits of the innovation (for a discussion see Fox, 2000). This top-down model of diffusion has, however, little to say about the identities, capacities or competencies of those the technology affects or the role of those who use the technology except that, to the extent the technology or initiative is resisted locally, this often leads to efforts to by a centre to persuade or coerce those affected. In contrast successful ‘diffusion’ in ANT terms means focusing upon the ways in which the extension of a centre to a periphery is dependent upon the translation of interests at the periphery.

Third, the construction of durable actor-networks that stabilise times and spaces has important implications for rethinking the boundary between micro and macro, organisation and environment that marks out much sociological and organisational analysis. ‘Inside’ the lab and ‘outside’ at the farm reverse into each other regularly and easily for Pasteur (for a discussion see Cooper, 1992). This does not mean that the organisation (the content of laboratory activities) and environment (the societal context) are identical because only a few translations occur in the movement from farm to lab and then from lab back to farm, but it does mean that inside and outside constantly being folded into one another and this means that content and context are inter-constitutive. More generally, then, organisation is ‘an active process of displacement and transformation denies and defies such categories as inside and outside; it is more like a process that travels along sociotechnical networks’

(Cooper, 1992: 262). In Latour's narrative of the enterprising Pasteur every actor is translated or displaced such that 'Pasteur's lab is now in the middle of agricultural interests with which it had no relation before; in the farms an element coming from Paris ... in this succession of displacements, no one can say *where the laboratory is* and *where society is*' (Latour, 1999b: 265, 267 emphasis in original). Similarly for Cooper, the environment cannot be conceived as simply 'out there' as an independent domain that must be managed. It is more akin to a practice of cloning, circulation and folding and this means a new typology of movement is required:

Conventional organisational analysis typically views its field in terms of separate categories, which are assumed to inhabit insulated and singular spaces. The traditional division between organisation and environment is an example of this mode of analysis.... Since it [organisation and environment] is not a space of singularities but of intersections and interactions, it always works in terms of *folds* and *doubles*—for example, the complicity-antagonism fold of the inside-outside relationship.... the inside is an interiorisation of the outside, a kind of doubling of the outside. Pasteur's laboratory became a fold of the infected farm, his anthrax vaccine doubled the anthrax bacillus (Cooper, 1992: 269-270, emphasis in original).

For Latour (1999b: 259) science is one of the most convincing ways of persuading others of their identity and their interests. Porter (1995) discusses the emergence of a culture of trust in numbers and suggests an approach that takes translation rather than diffusion as its analytical starting point. Here innovations, techniques, etc., cannot be understood as just 'a servant of coercive power, enabling a centralised administration to make decisions over the heads of middle management.... [Rather] successful firms depend on vigorous decentralised activity' (Porter, 1995: 44-45). This means attending to the translation of decentralised interests through the constitution of identities. From this assumption science and technology might be generally considered as the proliferation of longer and more durable networks and new centres of calculation and coordination where knowledge does not travel or diffuse unchanged rather 'it travels along networks to new nodes, and what appears as universal validity is in practice a triumph of social cloning' (Porter, 1995: 15).

This emphasis upon translation, displacement and social cloning presage questions of power and domination in studying scientific practice or technological innovation.

2.8.2 Distinguishing, Purifying and Legitimizing Dichotomies

Latour (1993) articulates the ideological character of modernity's seventeenth century dualism with Hobbes's politics on one side (i.e., society) and Boyle's epistemology on the other (i.e., nature). Despite the asymmetry of society and nature there are two related symmetries between the state and the laboratory. Firstly, Hobbes's sovereign state 'grew from an episteme set by Galilean physics: the notion of things as atoms being generalized to citizens existing in mutual hostility in a force field' (Lash, 1999: 277). The social contract that 'human atoms' agree upon is their representation by a single and unified sovereign. Similarly, Boyle's science is based on a Hobbesian worldview, claims Latour, with scientists representing the 'parliament of mutes in the lab'. Secondly, political representatives are faithful witnesses of the citizenry, and scientists are scrupulous representatives of the facts. Citizens and things are rendered silent but represented in themselves by the parliaments known as the political chamber and the scientific laboratory. In both realms, representatives take faithful testimonies, make decisions according to these testimonies and agree that as a community the mute masses have not been betrayed.

The general contention that Latour (1993) puts forward is that essentialist ontologies dream of a purification of essences, through which the realms of society, technics and nature can be clearly demarcated and agency can be easily ascribed to particular realms. Yet the paradoxical power of modernity and the ability for long distance control resides, in Latour's terms, in its ability to create hybrids—quasi-subjects and quasi-objects—whilst

simultaneously disavowing their production.⁵ This is achieved through the maintenance of dichotomies between the human, the technological and the organisational, to name a few. For Latour and those sympathetic to actor-network theory the acceptance of ready-made or fully present unproblematic facts, objects or humans needs to be problematised. Otherwise a firm boundary is too easily constructed between for example the ‘material properties’ of a technological artefact and ‘contextual’ social relations. The purification of boundaries makes problematisation and interrogation of the black box of the technical or the social increasingly difficult to do. Bloomfield and Danieli (1995) provide an example of this in relation to the introduction of an information system. In their research the introduction of an information system in an NHS hospital was to be deployed to produce letters about patients to be sent to their general practitioners. The automation of letters required standardising the content with data that was already coded onto the information system. Some doctors objected to the inflexibility of this system and wanted to include non-standardised information. One response by the consultants to this was that doctors should find ways of coding non-standardised comments so that they could be held on the information system:

[And thus] we see a translation in operation: the problem as seen by the doctors—the rigidity of the information system—was translated in terms of the lack of standardisation inherent in doctors’ practice vis-à-vis the discharge of letters. What could be seen as a technical problem was reconceptualized as an organisational one—a problem of organisational efficiency due to non-standardisation of an informational practice on the part of the doctors (Bloomfield and Danieli, 1995: 38).

Through a double process of translation and purification the relationship between the information system and organisational practices is rendered into a particular problem that is analysable into separate domains. In this instance the implication is that the problem is with professional medical practice rather than with information technology, that is to say, a particular boundary; ‘soft’ non-technical and ‘hard’ technical in this instance.

⁵ A quasi-object becomes a ‘black box’ when its heterogeneous relations are invisible or forgotten. Examples of ‘black boxes’ would include scientific facts, technical equipment and citations in academic publications.

2.8.3 The 'Modern Constitution', Hybrids and Non-Human Actors

Latour (1993: 13-48) sets out four guarantees of the modern constitution in articulating his approach to understanding technoscience. These are i) *nature* and *things* are transcendent, ii) that *society* and *subjects* are immanent, iii) the *movement* between nature and society does not occur, and, iv) that a '*crossed out*' God no longer interferes but remains as an infinitely remote sovereign judge. The basis and novelty of Latour's argument is that the modern constitution is paradoxical because it has to undercut its terms of classification in order to sustain itself: that is to say, there is double movement of translation and purification that deletes and conceals translations and this renders realms as purities. This results in the production of hybrids on a scale never witnessed in history whilst simultaneously rendering accounts of hybrids impossible! Latour (1993) draws upon Serres (1982) to introduce the mixture of 'transcendent nature' and 'immanent society' that produces quasi-objects and quasi-subjects. Society is partly transcendent and enduring through the enrolment of nature, objects and technologies.

Latour's (1993: 49-90) quasi-subjects and quasi-objects provides an approach to reanimate the relationship between actors and extend what counts as an actor (often referred to as an actant). MacKenzie and Wajcman (1999) describe this as an ambitious philosophical critique of most forms of existing social theorising because of what Latour considers a failure to account for technologies as actors. For Latour (1991) 'technology is society made durable' and therefore to analyse social relations as if they are *a priori* separate from technology is fundamentally problematic. It reproduces modernity's desire for pure categories when 'we might call technology the moment when social assemblages gain stability by aligning actors and observers. Society and technology are not two ontologically distinct entities but more

like phases in the same essential action' (Latour, 1991: 129). For Latour (1993: 49) the undoing of modernity has come about because it is a victim of its own success:

The modern Constitution has collapsed under its own weight, submerged by the *mixtures* that it tolerated as material for experimentation because it simultaneously dissimulated their impact upon the fabric of society. The third estate ends up being too numerous to feel that it is faithfully represented either by the order of objects or by the order of subjects [emphasis added].

This proliferation of hybrids or 'quasi-objects' and 'quasi-subjects' (see Serres, 1982) means that both culture and nature have to be entirely rethought without recourse to dualisms or dialectics. Dictotomies consist, for Latour, of literally 'seeing double'. Social scientific knowledge is faced with two choices: objects are either passive receptacles for society's categories or omnipotent and determine human activity. Latour (1993) elaborates this argument contending that the delineation and maintenance of dualistic thought has been *the* methodological project of social science. For Latour, to be modern means to subscribe to two distinct processes that must be kept separate. Firstly, the practices of *transformation* or *mediation* through which what happens is made and composed, not merely by repetition and relay, but through emergence and transformation. Secondly, the practices of *purification*, with the creation of distinct ontological realms such as nature and culture are enacted. This double asymmetry of transformation and purification is maintained as long as purification is upheld. The proliferation of hybrids is paradoxically only rendered possible to the extent that the realms of culture and nature can be purified of each other and thus kept apart.

There is a 'certain price of extension of networks for measuring and interpreting' (Latour, 1993: 117-122). This is quasi-objects that measure and interpret and the initiation and training of quasi-subjects that also measure and interpret. Through a symmetrical analysis of actors the technoscience method of actor-network theory claims to bypass both social

constructivism *and* realism (see Latour, 1999a: 16). The symmetrical treatment of humans and non-humans is not intended to anthropomorphise non-humans actors but rather to underscore that technology is not infinitely plastic. Technologies cannot be shaped in just any old way by social forces just as much as technologies do not only have their own independence and momentum separate to sociality (Coomb et al., 1992). This is why for Latour (1999a) the asymmetry of constructivism and realism is not and never has been a pertinent question for science studies or social theory; constructivism examines making done by immanent subjects, and realism turns to the causality of transcendent objects. The task is not to claim a position on the agency and structure debate but to ignore the question in the first place:

To sum up in one single formula: 'out there' nature, 'in there' psychology, 'down there' politics, 'up there' theology. It is this whole package that by happenstance ANT called into question at once.... If ANT can be credited with something, it is to have developed a science studies that entirely bypasses the question of 'social construction' and the 'realist/relativist debate' (Latour, 1999a: 22-3).

This is perhaps easier said than done for social scientists working through the legacy of strong divides between subject and object. Scientists require devices for the production of experiments just as instruments cannot be used without drawing on durable scientific knowledge. Claiming that actors or actants are materially and relationally constituted does not mean there are no inequalities in the resources that can be mobilised. Latour (1993) claims that a non-modern constitution is made up of human and non-human actors or actants. This claim is important for social theorising because what is at stake are critical assumptions about the human condition. Actor-network theory's symmetry means that for analytical purposes no particular actor is considered as distinctly prior, primary or fundamental. It means taking seriously that what it is to be human is constitutively technological, social, cultural, natural, and so on. Latour (1993) thus inverts the symbolic interactionists' demand for a 'parliament of selves' with a 'parliament of things'. This term

is important for understanding Latour's work as it is this 'parliament of things' that makes scaled effects over space and time possible. As mentioned above what is considered universal, or that which is 'relatively universalistic', is constructed by quasi-subjects and quasi-objects (Latour, 1993). The third guarantee of Latour's modern constitution articulates the impossibility of movement, translation or mediation. Purification into subject and object conceals and deletes the work of hybrids or intermediaries that are neither complete subjects nor objects.

The fourth guarantee of the modern constitution is the 'crossed out' God (Latour, 1993). The proliferation of profane quasi-subjects and quasi-objects is also made possible through demarcation of God as purely sacred. This means that subjects and objects are not considered ontologically, in terms of being or existence, but in epistemological terms only. The granting of a 'parliament of things' provides for a reanimated sensitivity or modesty about the production of hybrids; it means taking seriously the existence of 'things'. This is why Latour's (1993: 141) fourth guarantee of a 'non-modern constitution' is 'perhaps the most important—[it] is to replace the clandestine proliferation of hybrids by their regulated and commonly-agreed-upon-production. It is time, perhaps, to speak of democracy again, but of a democracy extended to things in themselves'. I think we need to be careful about saying 'extending power to things in themselves' in the context of Western philosophy as it invites a return to essentialism or 'residual technicism' (see Grint and Woolgar, 1997), but as shown above Latour does not return to naturalism with the agency he grants to objects; objects are not caused by subjects, but rather their agency is similar to subjects that judge, measure and mediate. Latour (1993: 141) sets out his nonmodern constitution, in which objects have rights and responsibilities, in Table 1 in Appendix 1:

In the concluding paragraphs Latour comments: 'We have been modern. Very well. We can no longer be modern in the same way'. Latour's (1993: 85-90) suggestion is for a non-modern constitution that is constituted of 'variable ontologies'. It is through this 'ontology of mediators' that purification along a 'latitude' of nature and society *and* a 'longitude' that is '*a gradient that registers variations in the stability of entities from event to essence*' can be traced (Latour, 1993: 85, emphasis in original). Put another way, it means generalising the aphorism that 'existence precedes essence' to include nonhuman actants *and* tracing 'essences as events and trajectories'. For example, a technological object, like any actant, is made up, for Latour, of ontologically variable properties of *object, subject, discourse and being*. Under the modern constitution these four ontological properties are incompatible, but with the move from essences to events, 'reality, language, society and being' can all be understood as 'trace networks'.

2.8.4 From Laboratories to Work

The focus on researching scientific laboratories provides a clear site for empirical research, but can also lead to an overly narrow definition of what constitutes a laboratory for those interested in organisational analysis. There are a number of possible explanations for this focus. First, the word laboratory is taken literally so empirical research takes place in scientists' laboratories. Founding studies by Latour and Woolgar (1979) and Lynch (1985) are illustrative of this, as is Law's (1994) more recent research study of the Daresbury Laboratory. Second, ethnographic studies of 'science in action', to borrow Latour's words, are a comparatively recent phenomenon and those within science studies may be reluctant to move into other institutional domains. Third, and related to the reluctance to widening the concept of a laboratory, social studies of science remains a fledging academic field. Fourth, laboratory studies have been so successful during the 1990s that their assumptions

have started to colonise other fields of study such as organisation theory, such that organisational activity is understood as a form of laboratory-like work.

Broadening the realm of the laboratory from 'more cherished examples of the field' (Miller and O'Leary, 1994: 145) provides one valuable way of reanimating social and organisational theorising. Law's (1994) ethnographic study of the laboratory can be taken for example as a detailed account of the character of modern organisation and enterprise culture, and, as such, it is of empirical interest and relevance to those working in the field of organisation studies. More importantly, though, it is important to how social scientific theorising is conceived. The etymological link of laboratory with labour is instructive for this as it points to transformations of the world brought about by *work*, defined not only as the work of scientists but as work more generally.

For Miller and O'Leary (1994: 145) the narrow definition of the laboratory retains a 'faint whiff of scientism' that has 'more of an eye towards the past' than the future. Schaffer (1994) provides an example of what a rethought future might comprise of, according to Miller and O'Leary. He portrays the emergence of the early nineteenth century factory as the locus for the transformation of the world in all senses according to the principles of the scientific laboratory, that is, 'a space for interfering under controllable and isolable conditions with matter and energy' (Hacking, 1992: 36, quoted in Miller and O'Leary (1994). Miller and O'Leary (1994: 120-1, emphasis added) go on to claim that the factory resembles a laboratory in terms of its role as a theoretical and experimental space for the transformation and creation of phenomena:

For the factory is as much a site of invention and intervention as the laboratory populated by physicists, chemists, and the like. This is self-evident for the products made in the factory. But the factory is a site of invention and intervention in a further important sense. *It is here, on the shop floor, that new realities are created out of the dreams and schemes of diverse agents and experts based in a multiplicity of locales.... Out of such interventions have emerged new physical spaces on the*

shop floor, new ways of calculating, new forms of work organisation, and new modes of economic citizenship. Together, these disparate devices form a complex of interrelated practices for governing economic life.

Positing that factories and workplaces more generally resemble a laboratory is useful in making visible the recombinatory and transformatory ‘practices for governing economic life’, the reduction of ‘environmental uncertainty’ and the affordance of long distance control. It has already been suggested why those in science studies might hold onto research into scientific laboratories, but a further explanation for the emphasis relates to the contribution of the ‘first wave’ of science studies (see Latour, 1999a: 22-24). This ‘first wave’ focused on the network-building and stabilisation achieved by actors like Pasteur, as described above. This constituted science studies’ contribution to rethinking scientists’ work. In the pursuit of explaining scientific objectivity, that is to say, stabilised networks that hold heterogeneous elements together, critical commentaries argued that these studies tended towards providing a managerial, objectivist and functionalist account concerned with network-building and maintenance. This first wave of science studies was also charged with one-dimensional accounts of Machiavellian men, of a ‘hairy gorilla-like character’ that reinforced ‘big men’ claims of history (for more detail see Latour 1999a).

Miller and O’Leary (1994) take up the criticism of an over-emphasis on stability and managerialism which is associated with actor-network theory. They attempt to reconfigure the future relevance of ‘the laboratory as factory’ into an approach which foregrounds instabilities, tensions and provisional relations through the deployment of the term ‘assemblage’. For Miller and O’Leary (1994: 125-6, emphasis added) the formation of an assemblage is a productive way of rethinking the focus on the laboratory:

... the forming of an assemblage, the emerging of a historically specific complex of relations around a particular issue, *the establishing of horizontal linkages and relays among a multiplicity of locales and practices.* Each of the components of this *assemblage is itself unstable, traversed by tensions, susceptible to multiple*

interpretations, meanings and utilisation.... it differs in emphasizing the instability of relations that form between such components.... the temporarily stabilised complex of relations.

For Miller and O’Leary it is the implicit articulation of how ‘environmental uncertainty’ can be reduced and eliminated as opposed to an emphasis upon ongoing instabilities and tensions that they consider problematic in many actor-network theory accounts. Miller and O’Leary (1994: 146) argue network-building often seeks to ‘isolate itself from the outside world. But the “outside world” kept getting in’. One response to this has been an attempt to show how ideas, devices, programmes of action, for instance, are regularly translated, reconfigured and stabilised in different actor-networks (see, for example, Bloomfield et al., 1997). In Miller and O’Leary’s terms, however, this approach remains caught in a form of analysis that approaches instabilities as in between stability.

The permeability of the assemblage, for Miller and O’Leary, does not retain the tendency to account for the removal of environmental uncertainties through stabilisation, homogenisation and closure or what might be understood as a tendency in actor-network theory for a ‘relational functionalism’. Latour’s account of network building does invite the kind of criticism that Miller and O’Leary invoke, and Latour (1999a) acknowledges the way in which actor-network theory has been concerned with explaining the maintenance and stability of heterogeneous networks. Yet for Miller and O’Leary (1994) the concept of network building remains too static and constraining because it places too much emphasis on ‘a given actor who enrolls and controls others’. Their proposal is for a much more explicit focus on ongoing and relational instabilities and movement:

For it is unclear who might be considered to be translating whom, what is being translated in what. In any case, this would be to propose a movement between two given points rather than their co-emergence. The forming of the assemblage ... is instead the mutual constitution of the agents and entities that make it up, a process akin together of a plethora of ‘mediating machines’.... It is the fragile and shifting complex of *relations* that is the object of our enquiry, not a given actor who enrolls

and controls others. If our analysis is guided by a philosophy, it is a philosophy of the relation rather than a philosophy of objects, entities and networks (Miller and O’Leary, 1994: 126, emphasis added).

Recent actor-network theory-inspired studies have attempted to take on these criticisms. These include Mol and Law’s (1994) depiction of fluids in discerning anaemia; Callon’s (1999) framing and overflowing in economic activity; Law’s (2002) account of the rhizomatic networks that are involved in constructing the TSR2 aircraft; de Laet and Mol’s (2000) study of the multiple translations that constitute the Zimbabwe bush pump; Holmström and Stalder’s (2001) account of the multi-purpose networks of Swedish cashcards, and Gomart’s (2002) study of methadone as a multiple object. Whilst the empirical focus of each of these studies is distinct they share an attempt to reanimate actor-network theory through the work of Deleuze and Guattari.

2.9 Actor-Networks as Rhizomes and Assemblages

Latour (1999a) argues that usage of the term ‘network’ has lost its former ‘cutting edge’ association (see also Law, 1999) with transformational processes and has become enrolled in the service of particular technological, economic and social trends variously described as the ‘information information’, ‘network society’ or ‘knowledge society’:

Now that the World Wide Web exists, everyone believes they understand what a network is. While twenty years ago there was still some freshness in the term as a critical tool against notions as diverse as institution, society, nation-state and, more generally, any flat surface, it has lost any cutting edge and is now the pet notion of all those who want to modernize modernization. ‘Down with rigid institutions’, they all say, ‘long live flexible networks’ (Latour, 1999a: 15).

The term ‘network’, he continues, has lost much of its former critical significance:

[Thus], the word network, like Deleuze and Guattari’s term rhizome, clearly meant a series of *transformations*—translations, transductions—which could not be captured by any of the traditional terms of social theory. With the new popularisation of the word network, it now means transport *without* deformation, an instantaneous, unmediated access to every piece of information. That is exactly the opposite of what we meant (Latour, 1999a: 15-16, emphasis in original).

The legacy of Deleuze and Guattari's (1988) work for actor-network theory is explicit here with the suggestion that actor-network theory might more usefully be termed 'actant-rhizome ontology'⁶—were it not for 'such a horrible mouthful of words' and the unappealing acronym 'ARO' (Latour, 1999a). Yet instead of inventing another three-letter acronym, even if this is suggested with some irony because Latour claims never to have used the acronym 'ANT', the disjunction between a 'network' in a Latourian sense and 'network' in the sense of information and communication technologies (e.g., integrated databases) and the 'network society' literature of recent social science theorising (see Castells, 1996; Heckscher and Donellon, 1994; Pettigrew and Fenton, 2000; Urry, 2000, Thompson, 2002) provides the basis for a productive way into responding to the criticism that 'micro-sociologies' such as ANT are ahistorical. The disjunction between Latour's rhizomatic 'networks of transformation' and Castells' (1996) 'networks without deformation' demonstrates the double-edged character of social theorising: it illustrates both the potential radical novelty *and* the Procrustean tendencies of novel ideas. 'Networks' become associated with heterogeneous non-human actors, feminist emancipatory practice and multinational corporate strategies! (see Chapter 3).

The transformations and mediations that constitute Latour's (1999a: 19) hybrids resonate with Deleuze's central preoccupation with movement, assemblages and rhizomes (see also Law, 2002). For Deleuze, a lifelong concern was the attempt to put movement into thought—to induce into movement (Zourabichvilli, 1994). For Latour, this movement is translation or displacement and Deleuze (1994: 8) states:

⁶ The *OED* defines a rhizome as 'a continuously growing, usually horizontal, underground stem, which puts out lateral roots and adventitious roots at intervals'. Deleuze and Guattari (1988: 21-25) state that 'unlike trees or their roots, the rhizome connects any point at any other point, and its traits are not necessarily linked to traits of the same nature ... The rhizome is reducible neither to the One nor the multiple. ... It is composed not of units but of dimensions, or rather directions in motion. In contrast to centred (even polycentric) systems with hierarchical modes of communication and preestablished paths, the rhizome is acentered, non-

[I]t is a question of producing within the work a movement capable of affecting the mind outside of all representation; it is a question of *making movement itself a work*, without interposition; of substituting direct signs for mediate representations; of inventing vibrations, rotations, whirlings, gravitations, dances or leaps which directly touch the mind [emphasis added].

In characteristically difficult language Deleuze is setting out how the everyday suspension of disbelief that enables action is a convenient form of reassurance from fundamental ontological uncertainties: that is to say, the non-essentialist ontological character of the world is becoming rather than being. The inducement into movement is always and already occurring so it is a case of going into an already existing movement. For Deleuze with Parnet (1987: 121), who invokes the example of surfing, this means there is 'no longer an origin as starting point, but a sort of putting-into-orbit. The key thing is how to get taken up in the motion of the big wave, a column of rising air, to "get into something" instead of being the origin of an effort'.

De Laet and Mol (2000) provide an example of how assemblages are traversed by ongoing translations and how it is these movements that often hold an object together (see also Chapters 7 and 8). Their research, which follows the development and use of a water pump in communities in rural Zimbabwe, demonstrates how a Swedish-designed water pump is locally translated in ways such that the pump is considered workable. Rather than the bush pump as immutable mobile (Latour, 1990: 26), that is, something that remains the same as it moves through space and time, the bush pump is a mutable mobile. Put another way instead of a focus on Pasteur, the heroic scientist, whose laboratory practices in French farms, de Laet and Mol underscore the way in which decentralised practices (in terms of the pump at least) associated with the bush pump translate the intentions of a 'centre of calculation', in this case the conditions for use of the water pump in Sweden, to those in

hierarchical, nonsignifying system without a General and without an organizing memory or central automaton, defined solely by a circulation of states'.

villages across Zimbabwe. The general point that de Laet and Mol make is that the bush pump is far from an all-powerful and immutable object that holds the actor-network together over space and time. It is rather rhizomatic negotiations, proficiencies and skills 'in the field' that produce the conditions for the water pump's power—its ability to provide drinkable water (see also Mol and Law, 1994). Holding things together can also be expressed as a 'problem of consistency' on which Deleuze and Guattari (1988: 327-28, emphasis in original) remark that:

Even in a territorial assemblage, it may be the most deterritorialised component, the deterritorialising vector, in other words, the refrain, that assures the consistency of the territory. If we ask the general question, 'What holds things together?', the clearest, easiest answer seems to be provided by a formalising, linear, hierarchised, centralised *arborescent* model.... It seems more important to us to underline a certain number of factors liable to suggest an entirely different schema, one favouring rhizomatic, rather than arborified, functioning, and no longer operating by these dualisms... This obviously excludes any linear relation from one centre to another, in favour of packets of relations ... if only for the purpose of assuring the dominance of one among them.

Jackson and Carter (2000: 252-257) provide an example of the application of a rhizomatic approach to organisation analysis. They argue that organising is rhizomatic such that 'not only are humans organised rhizomatically, but also they organise rhizomatically'. This means that organisations are 'constituted by flows of desire, belief, micropolitics, micro-power, which are unspecifiable, unpredictable and uncapturable and which may, or may not, lead to specific, predictable and identifiable outcomes' (Jackson and Carter, 2000: 252-53). Their account of organising as rhizomatic is however one that Deleuze and Guattari would find problematic because although they reverse the hierarchy of 'predictable/unpredictable', but they leave the hierarchical relationship intact. It is worth quoting Deleuze and Guattari's characterisation of a rhizome at some length to illustrate their approach to understanding the rhizome:

There are knots of arborescence in rhizomes, and rhizomatic offshoots in roots....
The important point is that the root-tree and canal-rhizome are not opposed models:

the first operates as a transcendent model and tracing, even if it engenders its own escapes; the second operates as an immanent process that overturns the model and outlines a map, even if it constitutes its own hierarchies, even if it gives rise to a despotic channel. ... It is a question of a model that is perpetually in construction or collapsing, and of a process that is perpetually prolonging itself, breaking off and starting up again. No, this is not a new or different dualism. The problem of writing: in order to designate something exactly, inexact expressions are utterly unavoidable. ... *We invoke one dualism only in order to challenge another. We employ a dualism of models only in order to arrive at a process that challenges all models* (Deleuze and Guattari 1988: 20, emphasis added).

Deleuze and Guattari state that dualistic approaches of *either* root-trees *or* canal-rhizomes are problematic and that what is required are approaches which are not 'either/or' but 'both/and' (see also Brigham, 2001). Latour's emphasis on rhizomatic becoming is, then, a response to the criticism that actor-network theory is overly preoccupied with stabilisation and ordering rather than a critique of stabilisation or order itself. For those interested in developing a Deleuze and Guattarian-inspired actor-network theory, which means overcoming rather than reversing dominant dualisms, one way of approaching this problem is to posit different temporal displacements and deferrals, what Patton (2000), writing about Deleuze, describes as 'lines'. 'Rigid lines of segmentation' are contrasted with 'supple lines of segmentation' that are described as qualitative or molecular multiplicities. These 'supple lines' are bound up with the almost invisible micro-cracks that affect subtle shifts, that is, rhizomatic movement that 'happens almost without your knowing it but is realised suddenly indeed'.

Latour's (1993) variable ontologies discussed in sections 2.8.1 and 2.8.3, with latitudes from event to existence and longitudes of purification, is another way of expressing Deleuze and Guattari's 'lines'. Callon (1998) provides another way into lines, latitudes and longitudes. Drawing upon Goffman's frame analysis of personal relationships, Callon sets out frames and flows in an attempt to reformulate movement into circulating capacities. Callon's (1998) description of the process of framing or summing up and overflowing in

relation to economic externalities⁷ attempts to demonstrate that framing and overflowing has to occur simultaneously and demonstrates the Deleuze and Guattarian inspiration for actor-network theory. He describes two approaches to framing and overflowing in order to recast both notions:⁸ first, the proposition that framing is the norm and overflows are leaks, and second, that overflows are the norm and framing is expensive and incomplete. Callon (1998: 254) states that everything that goes into making the frame 'at the very same time as it is helping to structure and frame the interaction of which it more or less forms the substance, is simultaneously a potential conduit for overflows'. Here elements are at once resources and intermediaries that frame interactions *and* provide passages elsewhere. A frame that was completely successful, with success defined in terms of the specification in advance of what was relevant, would be paradoxical because it would only allow for the expression of pre-existing know-how. No matter how abstract or institutionalised, all frames operate, then, in a world of excess but it is more than just operating with overflows and excess. Frames are *constitutively dependent upon* relations that escape them: it is through 'contamination, contagion, conversion, and other forms of transversal communication' that life proceeds (Ansell Pearson, 1997: 6). It is, in other words, out of such framing that becoming or rhizomatic movement *qua* overflowing occurs (see Callon, 1998).

Within the field of organisation studies, Cooper (1998) made one of the first contributions to incorporating 'assemblage' into the vocabulary of organisational analysis. The *OED*

⁷ Callon (1998) provides examples of negative and positive externalities. A negative externality would be, for example, environmental pollution caused by a particular industrial process for which the company does not bear responsibility.

⁸ Callon's frames and overflows resonate with Prigogine (1980: 26), who argues for a nuanced depiction of being and becoming rather than a reversal of pre-dominant assumptions. 'We can move beyond the classical conflict between being and becoming. Being is no longer the primordial element, just as becoming is no longer an illusion, the product of ignorance. Today, we see that becoming, which is the expression of instability in the universe, is the primordial element. Yet, in order to express this, we also need elements that are permanent.'

defines assemblage as: '1. A bringing together or coming together; the state of being collected together. The fitting or joining together of a number of components. 2. A number of things grouped together; a collection, a cluster. A number of pieces fitted together'. Assemblage, Cooper notes, comes from the Greek '*sumbolon*', which means the act of bringing together of various parts. Thus 'ancient Greek mystery religions used the *sumbolon* as a token of recognition: two halves of a broken piece of pottery, when jigsawed together, served to unite the initiates' (Cooper 1998: 110). Similarly, in English, assemblage appears with 'symbol' and 'simple', which, as Cooper points out, 'both mean the joining of the disparate'. Assemblage, which is translated from the French *agencement*, can be translated as arrangement or organisation and for those interested in organisation and organisations, *agencement* has immediate and obvious relevance. It is, however, the particular conception of organisation that *agencement* evokes that is important. For Deleuze, the importance of the term assemblage is that it is defined as 'social machine', that is, organisation is relational and distributed rather than straightforwardly locatable. 'It is a multiplicity which is made up of many heterogeneous terms and establishes liaisons, relations between them, across ages, sexes ... the assemblage's only unity is that of co-functioning: it is a symbiosis' (Deleuze with Parnet, 1987: 69).

Deleuze and Guattari (1988) propose the concept of assemblages as instructive for conceiving what phenomena is worth attending to in order to work through and beyond dichotomies (see also Cooper, 1998). Assemblage is relational multiplicity and as such it only makes sense to conceive of an assemblage as 'a multiplicity [where] what counts are not the terms or the elements, but what there is "between", the between, a set of relations which are not separable from each other' (Deleuze with Parnet, 1987: viii). For Deleuze and

We cannot have becoming without being, just as we cannot have light without darkness or music without silence'.

Guattari assemblages are comprised of technico-affective relations that are constitutive extensions, supplements and mediations. The analytical focus on assemblages denotes the contention that the human subject or the status of organisation cannot be located and exclusively depicted within the realm of the human subject or organisation as such. The focus on assemblages denotes the interdependencies and irreducibility of discursive and non-discursive relations. For Deleuze and Guattari this is also expressed in terms of 'forms of content', which are also termed 'machinic assemblages' and comprise of interactions, corporeal bodies and practices, and 'forms of expression', which are termed 'assemblages of enunciation' and comprise of utterances, speech acts and statements (see also Patton, 2000: 44).⁹ The human subject is the 'borrowings', distributions and displacements of these machinic and enunciative assemblages.

Deleuze and Guattari (1988: 394-415) illustrate technico-affective relationality through the transformation constituted by assemblages of human-horse-plough (see Lee, 2001: 113-17).

The human-horse-plough assemblage can be understood by the symmetrical analysis of non-discursive and discursive relations that are the limit and support one another, and it is in the relations of human-horse-plough that becoming human is defined (see also Latour, 1999; Law, 2002). For horses to become mounts they had to be captured and trained to respond to commands so that humans could borrow their legs and lungs and move faster and over greater distance. But the human subject changed no less than the horse because the

⁹ The relational character of assemblages can be delineated into assemblages of 'content' and 'expression' as non-discursive and discursive relations, and 'territorialisation and deterritorialisation' as the movements and transformations of assemblages that are reactive and active forces, quantitative and qualitative differences and actual and virtual multiplicities. An example that Deleuze and Guattari (1988: 66-7) provide is of an individual, pronounced guilty by a judge, who then becomes a 'criminal'. Technologies act as expressions of a particular discursive content of 'guilty'. Judging an individual as 'criminal' has effects on this subject's movement which cannot be understood outside of particular set of non-discursive practices (e.g., imprisonment or tagging). The assemblage of enunciation that expresses 'guilty' only has effects through time and space to the extent that it is interwoven with non-discursive relations such as prison cells or electronic tags. The 'criminal' undergoes an incorporeal transformation in the sense that the individual is put into very different sets of non-discursive relations without a direct material transformation of the individual as such (see also Wise, 1997: 63-4; Brown et al., 1998).

capacity of knowing about horses' strengths, fears and how to stay mounted whilst on the move did not predate humans' capacities as 'riders' (see Lee, 2001). The provisional human-horse assemblage is also always subject to movement when it comes up against other assemblages. In their example the assemblage of agriculture diversified the human-horse assemblage because it 'made it possible to use heavier ploughs than before, to dig deeper furrows than could be dug using oxen' (Lee, 2001: 114).

Yet symmetrically the horse-plough assemblage is not a simple cause of sedentary forms of agriculture as this would presuppose a technological rationalism. Rather it is constitutive of the problematic of becoming human: 'the heavy plough exists as a specific tool only in a constellation where "long open" fields predominate ... where the land begins to undergo triennial rotation, and where the economy becomes communal. Beforehand, the heavy plough may well have existed, but on the margins of other assemblages that did not bring out its specificity' (Deleuze and Guattari, 1988: 399). Although horses are not *a priori* mounts, humans have not always been riders or farmers of long open fields and iron has not always been used for producing ploughs, each of these are brought into being through an ontological labour.

It is with this redistribution and transformation of competencies or circulating capacities in Callon's terms, that is, with the incorporation of the plough into the assemblage of long-open fields, that particular capacities of the plough are discerned. Here organisation is assemblage, that is to say, a multiplicity that 'is always collective, which brings into play within us and outside us populations, multiplicities, territories, becomings, affects, events' (Deleuze with Parnet, 1987: 87). Assemblages are not collections of individual items brought together to form enduring or complete entities or things, but inducements into movement. For Gomart and Hennion (1999: 221) this means 'forces take possession of the

self.... To talk in this way implies that there are techniques, settings, devices and collective carriers which make this active dis-possession possible [that is, entities as constitutively relational]. But to talk about these we need to stop asking, temporarily at least, about the sources of action. Questions such as “who acts?” no longer work’. The ‘between’, or ‘middle’ for Deleuze, or ‘circulation’ between multiplicity and singularity in Latour’s (1999a) terms, is a reconfiguration of Latour’s notion of hybrids into a form which much more explicitly approximates Deleuze and Guattari’s (1988: 3-25) ‘rhizomatic becoming’ (see Chapter 3). On this, Cooper (1998: 108) writes that ‘movement, then, comes in two forms: the movement of things in locatable space so that one is able to think and speak them (i.e., *locate*, from the Latin *loquor*, to say, tell, indicate), and where to place (i.e., *locate*) means to placate, please (Latin *placere*, to satisfy, be agreeable, resolve); the movement of the mute and mutable which cannot be spoken because its radical elasticity cannot be limited and thus located. So we might say that the strategies of locating and placing are ways of forcing the mute to speak, of disciplining the wildness of mutuality’.

2.10 Concluding Remarks

The purpose of this chapter has been to set out a range of ways in which the relationship between the technological, the organisational and the human condition has been approached. This has comprised of examining instrumentalist, determinist, end of ideology and substantivist approaches to technology. The chapter has also discussed Critical Theories in relation to technology and social constructivist approaches. The longest section of this chapter has been concerned with setting out the assumptions and contributions with which actor-network theory is associated. As part of this the last part of this chapter attempted to recover the sense of actor-network theory’s variable ontology as comprised of rhizomatic transformations.

In prefacing the next chapter, which examines the relationship between being and becoming in detail, Deleuze and Guattari begin the concluding chapter of their final joint work with the following cautionary words: 'We require just a little order to protect us from chaos' (Deleuze and Guattari 1994: 201). Guattari responds to the accusation with a cautionary tone and states that their conception of rhizomatic movement 'was completely contrary to some ode to spontaneity or a eulogy to some unruly liberation. It was precisely in order to underline the artificial, "constructivist" nature of desire that we defined it as "machinic", which is to say, articulated with the most actual, the most "urgent" machinic types' (quoted in Genosko 1996: 128). Deleuze and Guattari are clear that it would be a mistake to conceive of rhizomatic movement as completely undoing a sense of organisation, technology or the human. The critical and creative task at hand is not, therefore, to be anti-technology, anti-organisation or anti-human as such, but to *induce into movement* particular *ways of evaluating technology, organisation and the human condition*. This means that Deleuze and Guattari are concerned with 'becoming revolutionary' and this implies that they are interested in 'transformation in the forms of social organisation of work and desire, and the possibility of redistribution of the molar assignment of differential power and affects ... but not the abolition of molarisation as such' (Patton, 2000: 83). This is what Burrell (1998: 150-1) hints at when he writes that '[w]hat might be needed is not so much a chopping down of the tree and the nurturing of the rhizome as a fundamental rethink as to what is knowledge itself'. It is a caution not of common sense but rather of an elaboration of the chances, passions and risks of refiguring relations between organisation, technology and the human, a theme that is developed in more detail in the next chapter.

Chapter 3: The Organisation of Becoming and the Becoming of Organisation

'[For] as soon as molecular biology makes possible a manipulation of the germen [genetic splicing, for example] through the intervention of the hand, the [genetic] program receives a lesson from experience. The law of life [that of evolution by slight variation] is thereby purely and simply suspended.... Molecular biology, in its technical actuality, makes the exit from the laws of evolution possible, or ... only apparently; for one should in fact affirm that molecular biology reveals that the 'laws of evolution' have been suspended for a very long time—at least since the invention of man, that is, of technics, and that it is no longer possible to ignore this when this suspension is gaining an actuality that is radically new'.

Bernard Stiegler, 'Technics and Time'.

'Cyborganization is therefore not just a thing, or even a collection of things like actors, buildings, projectors and celluloid, but a continually shifting set of relationships. The openness and mutability of these relationships is what allows for the production of art/efacts.... After all, if the relationships were fixed, then only one form of production could exist and only one kind of product could be produced. This, in a metaphorical way, is the essence of the endless dichotomy between Fordist, mechanical, modern and bureaucratic representations of organization versus post-Fordist, organic, postmodern or flexible formulations. In other words, all organization is both sides of these impossible divides at once, both stable and flexible, systematic and nervous. It has to be that way if both repetition and innovation are possible, and they always are because one would make no sense without the other. Another way of putting all this is to say that organization is the systematic distribution and redistribution of organs, both human body parts and manufactured tools.... This way of thinking about technology and organization clearly moves us away from either a calculative view of systems in which humans are irrelevant—'a dream of absolute clarity'—or one in which human intentions are sovereign—'the revenge of sociologists, psychologists, ethnographers, hermeneuticians, management experts, organizational scientists and other "softies"'.... The distributions and delegations of cyborganization are all different ways of connecting information, not information as messages transmitted from A to B... but mobile patterns of repetition and difference'.

Martin Parker and Robert Cooper, 'Cyborganization: Cinema as Nervous System'.

'The widespread appeal of these new images of the ideal warns us, veterans of other ideological projects, to be cautious'.

Emily Martin, 'Fluid Bodies, Managed Nature'.

3.1 Introductory Remarks

The purpose of this chapter is to provide an account of the relationship between being and becoming and to relate this to translation/transformation and purification. This chapter develops further points made in the latter part of Chapter 2 and prefaces Chapters 6 to 8. In order to respecify philosophical and political thinking on 'becoming organisation', 'becoming technology' and 'becoming human' this chapter is organised in the following way. After some further introductory remarks below, Sections 3.2 and 3.3 set out being and becoming within general philosophical debates and delineates the relations between being and becoming into a typology of nihilism. The argument introduced in this section is that the condition for re-evaluating socio-historical assumptions of organisations, technologies and the human subject involves not so much a critical working *against* something as a genealogy that works *through and beyond* particular social, historical and technical effects. This means providing a critique of the terms of intellectual engagement with those who would posit, for instance, technological devices as free-standing entities with *a priori* properties *and* those who would subject the fate of technological devices to dynamics that are purely social. *Both* analytical positions characterise technological devices as having particular forms of freedom and are no longer appropriate: the former, freedom to determine the actions of others, the latter, freedom to be put to any use.

Sections 3.4 and 3.5 introduce Nietzsche and Bergson respectively, elaborating how each constructs becoming, difference and multiplicity as the 'ground' of the human condition. This provides the basis for Section 3.6, which examines in detail how Nietzsche, Bergson and Deleuze cannot be reduced to being against notions of enduring organisational forms, technological devices or the human subject *per se* but are rather against a particular form of evaluation that mistakes discrete causes for relational effects. As part of this, the argument put forward in this chapter takes issue with the contention that there can be simple choice

between organisation as distal or proximal (see Cooper and Law, 1995), humans as possessive or relational selves (see Lee and Brown, 2002; Parker, 2000) and technologies which are wholly determining or radically under-determined. In the concluding part of the chapter, in Section 3.7, the implications of 're-socialising' process thinking is re-stated.

3.2 The Becoming of Becoming?

Becoming goes by many names, including multiplicity and difference—'difference must be shown differing', says Deleuze (1994: 56). The concept of becoming is also deployed as a philosophical concept and basis for social and political contestation. In articulating an approach to organisational analysis that emphasises becoming, this chapter is concerned with the philosophy and politics of becoming, multiplicity and difference set out in the works of Nietzsche and Bergson and in Deleuze's writings on Nietzsche and Bergson. In setting out their approaches to the 'being of becoming' or what I term 'becoming organisation' or, more generally, 'becoming human', this chapter also suggests that there are both resonances and common targets of criticism in these philosophers' projects.

In order to grasp the kind of philosophical and political contribution Nietzsche, Bergson and Deleuze are concerned to make and how this is relevant to organisational analysis, it is critical, first and foremost, to understand that their abiding motivation is to disinter concepts of becoming, multiplicity and difference. This is variously expressed by Nietzsche in terms of 'active' and 'reactive' forces, by Bergson as 'qualitative' and 'quantitative' differences and by Deleuze, who refigures Nietzsche and Bergson, into 'virtual' and 'actual' multiplicities. As I set out in this chapter it is their privileging of becoming as active force, qualitative difference and virtual multiplicity with an alleged dismissive opposition to socio-cultural phenomena such as organisation because it is an expression of negativity and delimitation. The argument put forward in this chapter is that the simplistic

dichotomies that Nietzsche, Bergson and Deleuze are too often rendered into do little justice to their nuances but that, paradoxically, it is often those sympathetic to these philosophers' concepts who do much to sustain reductionist interpretations.

In beginning this chapter it is helpful to orientate Nietzsche, Bergson and Deleuze within contemporary social scientific and organisational theorising. Nietzsche has been a critical influence on postmodern thought in the study of organisations (Cooper and Burrell, 1988) and in the problematisation of long-held principles of moral and political philosophy (Ansell Pearson, 1991, 1997; May, 1999; Patton, 1993). Similarly Bergson is currently deployed as an alternative approach to organisational change (Chia, 1998, 1999, 2003; Tsoukas and Chia, 2002), to reconfiguring the ontological status of organisations (Letiche, 2000; Linstead, 2002) and the human condition (Ansell Pearson, 2002; Mullarkey, 1999, 1999a; Watson, 1998). Deleuze is now an influential philosopher (Ansell Pearson, 1997, 1997a, 1999; Grosz, 1999; Patton, 1996, 2000), cited across studies of science and technology (Law, 2002; Latour, 1999a) and organisation theory (Burrell and Dale, 2002; Cooper, 1998; Jackson and Carter, 2000; Parker and Cooper, 1998; Shenhav, 2003).

It is also useful to situate the preoccupation with 'being' and 'becoming' within wider political and cultural debates. Reed (1996) argues that conceptually innovative ideas are potentially subversive but that their actual impact 'is always refracted through existing power/knowledge relationships' and cannot therefore be separated from the social and historical contexts in which they are produced, debated and elaborated. For Reed (1996: 33) 'theory making is historically located intellectual practice directed at assembling and mobilizing ideational, material and institutional resources to legitimate certain knowledge claims and the political projects that flow from them'. 'Becoming organisation', 'becoming technology' and 'becoming human' are not, then, only philosophical concepts since 'becoming' is also currently deployed in management thinking and policy initiatives that

signal a shift from the mass production associated with Fordism to the 'new times' of a post-Fordist knowledge economy.

The contention that ideas and concepts are translated through a Procrustean bed of theories *in use* is well established in organisational analysis (Burrell and Morgan, 1979; Burrell, 1996). The association of becoming with continual change and flux, 'pure' economic forces and de-regulated markets is the latest example of how a theoretical concept changes its shape as it 'travels'. Chia (1999: 211), for example, quotes Kanter's use of process theorists to bolster the observation that economic circumstances are continually uncertain—evidence of the conflation of becoming with the legitimacy of reengineering organisations' structures and practices. Harvey (1989) provides a more critical analysis of the political economy of being and becoming in terms of changing perceptions and preoccupations that constituted Fordism and post-Fordism. For Harvey, Fordism was a political and economic management strategy that comprised of standardised manufacturing and mass consumption that gained increased momentum in the reconstruction of Western economies after the Second World War (see Lee, 2001: 7-20). It is well documented that in achieving mass production, classical management principles associated with F.W. Taylor enabled organisations to achieve significant economies of scale, but in order to connect political and economic policy to 'being' and 'becoming', Harvey argues, Fordism must be understood as much more than an approach to economic and manufacturing management. It is rather, as Harvey (1989: 135) remarks, 'a total way of life' in which the 'image of standard adulthood was supported by specific patterns in the organisation of people's working lives and in the organisation of their intimate relationships' (quoted in Lee, 2001: 10). It is in this sense that aligning the political and economic management of a national economy and individuals' public and private aspirations can be understood as constructing Fordist stability as 'being'. This 'way of life' comprised of large and stable organisations providing, for some at least,

long-term employment, 'jobs for life', internal career progression and relatively well-delineated career paths. It is constitutively supported by intimate relationships characterised by life-long marriages, strict divisions between men as the principal breadwinners and domestic labour done by women, and between adults and children. The adult as the 'human being' is 'stable, complete, self-possessed and self-controlling' and the child as a 'human becoming' is 'changeable and incomplete and lacks the self-possession' (Lee, 2001: 5).

Fordist advantages of stability were problematised, so say the economic analyses, in the early 1970s with the over supply of goods contributing to recessionary tendencies, competition from low-cost manufacturing economies in South East Asia and an incremental approach to investment and innovation associated with creating institutional rigidities. But more broadly, in Harvey's terms the shift from Fordism as 'human being' to post-Fordism as 'human becoming' is comprised of a turn to 'the idea that business has to become more knowledgeable in a turbulent and constantly fluctuating world' (Thift, 1997: 30) and to a generalised indeterminacy in analysing cultural phenomena. This is, then, also more than a business strategy for competitive advantage. It marks out another way of life or worldview with, for example, equivalences between 'human becoming' and life-long learning, 'boundary-less' careers with atypical employment patterns (see Heelas, 1996), 'workplace becoming' as continual innovation that 'reinvents the corporation' (Brown, 1991), and 'organisational becoming' as the unravelling of classical forms of organisational structure into 'virtual organisations' that consolidate organisational and individual flexibility and short-term management strategies (see Ackroyd, 2002). For these new times of restructured capitalism, management and ownership of creativity and innovation, and the dissolution of existing organisational boundaries *qua* becoming is the new knowledge economy asset. As a 'way of life', human becoming similarly supports adulthood around particular notions of

flexibility in which, for instance, intimate relationships are continuous for as long as both partners consider this appropriate and relationships are subject to renegotiation (Lee, 2001).

Despite the liberatory rhetoric of the organisation or individual freed from social and historical legacies there are distinctly 'hard edges' to such open-ended conceptions of the organisation or human subject outside of institutionalised legacies and practices (see also Dale and Burrell, 2000: 24-29). Thrift (1997) suggests that not only are existing capacities and protections challenged but conceptions and comportments of becoming are narrowly framed and associated with only certain activities, that is to say, becoming is subject to Procrustean tendencies of advanced capitalism. Such one-dimensional conceptions can be partly explained by the under-theorised connections between politics of becoming and philosophical concepts of becoming and partly because, as suggested above, when theories are understood in use, even 'notions of radical indeterminacy can be turned to all manner of ends, not all of which are pure or pleasant' (Thrift, 1997: 51). How, then, to account for becoming as the 'stuff of life' when its meaning is translated into a strategy of competitive advantage in the knowledge economy?

3.3 Being and Becoming and a Typology of Nihilism

Philosophers of becoming, multiplicity and difference are interested in problematising the metaphysical tradition that runs through Western philosophical thinking. This treats being and identity as primary and becoming as derivative or secondary. It constitutes, Patton (2000) suggests, a moral vision of the world that privileges stability, organisation and hierarchical relations. Beardsworth (2001) sets out how this dominant metaphysical tradition involves splitting the world into 'two worlds, two instances, two principles'. For Beardsworth the proposition of two worlds is a life-denying 'metaphysical nihilism' that is premised upon a divide between the transcendental-disembodied-abstracted and the

empirical-embodied-lived. Such schemas and evaluations are nihilistic, from the first instance, says Beardsworth, because they are concerned with getting away from our 'mean little world' (Nietzsche, 1968) of becoming human.¹⁰ Attempting to challenge this must mean attempting to unravel the historical hierarchy between being and becoming and articulating a philosophy of becoming, but it also means not lapsing into a second form of nihilism. This second type of nihilism is associated with the first in the sense that it is bound up with the realisation that the metaphysical categories important to the history of Western thinking (e.g., unchanging identity, discrete causalities, etc.) are no longer so convincing as they once were. This is, then, the 'all to human' shock that metaphysical categories do not articulate the world or have formal objective status. Rather they are historically and socially situated. Beardsworth (2001) terms this 'passive nihilism', that is, a sense of an exhausted world with no universal meaning and thus a human spirit that motivates questions phrased as 'so what!' or 'what for?'. It is, in other words, a nihilism that accompanies the disorientation and distress felt by the loss of a simplified metaphysical world of being and unity.

For Nietzsche, Bergson, Deleuze and others these two life-denying forms of nihilism invokes philosophy's moment of composure before the task ahead and the simultaneous clarion call to work through and beyond these two nihilisms in order to reclaim the future for humankind as a becoming human. In terms of organisational analysis this denotes a turn to 'becoming organisation'. Beardsworth's (2001: 38) typology, which draws on Nietzsche for inspiration, terms this 'active nihilism'. This is a search for an alternative to metaphysical beliefs through the re-evaluation of metaphysical schemas, which are nihilistic from the beginning, *and* the banalities of passive nihilism, which is a response to the loss of these metaphysical certainties. Beardsworth suggests (2001: 40) that active

¹⁰ Plato and Hegel are often associated with presupposing the primacy of identity (see Patton, 2000: 29-32).

nihilism marks out a way of thinking of the ‘complexity of the “now” ... as an immanent relation between “genealogy”, “energetics” and “ethics”’. It is, specifically, an approach to the genealogical character of the present set in motion by assemblages of, for instance, economic-administrative rationality and techno-scientific practice that attempts to overcome tendencies towards metaphysical and passive nihilism.

The connection between the philosophical, political activity and organisational analysis becomes clearer with this typology because what is at stake is an examination of the constitution and justification of the state of contemporary thought in relation to organisations, technologies and the human subject which are ‘matters that concern the community as a whole’ (Ansell Pearson, 1991: xii). This means a concern with the inadequacies of invoking an inversion of the ontological hierarchy between being and becoming on the basis that inversion does not alter the relation between elements nor changes the nature of those elements. Reversing the ontological priority from being to becoming would mean that ‘what really exists is not things but things in the making’ (James, 1996: 263, in Tsoukas and Chia, 2002: 567). As will become clearer throughout the chapter, I am sympathetic to the intentions behind process philosophers’ reworking of the primacy of an ontology of being, but that I also want to delineate a much more social, organisational, historical and, particularly, technical, ontology of becoming than is associated with some process philosophy approaches to organisational analysis. Put simply, this entails ‘re-socialising’ process thinking (term attributed to Bogdan Costea). Without this, there are three potential dangers in positing an ontology of becoming. Firstly, an ontology of becoming is conceived separately from social, organisational and historical practices and thus the basis of reality is rendered into something that is outside of human collective intervention. Tsoukas and Chia (2002: 570) provide an example of this tendency to separate out ‘brute’ reality from social and historical processes and contexts: they state

that organisation is a secondary accomplishment because organisation 'is a socially defined set of rules aimed at stabilising an ever-mutating reality by making human behaviour more predictable'. Secondly, because of this potential division, becoming is rather narrowly defined such that becoming itself has, ironically, a somewhat unchanging character! Instead I suggest that forces, whether they are social, technical, historical, and so forth, become *with* the world because they *are* the world and, as such, the world exists as a 'becoming world' constituted by the mediations and purifications of these forces. Thirdly, reworking a becoming ontology is a means of re-evaluating the association of becoming as 'ever-mutating' change as an instantiation of advanced capitalism.

Given the dangers mentioned above I find Deleuze and Guattari's cautionary injunction a valuable frame of reference: in re-evaluating current forms of organisational analysis 'you do not do it with a sledgehammer, you use a very fine file' (Deleuze and Guattari, 1988: 160-1). There are, in other words, real practical and analytical dangers in just reversing existing assumptions or hierarchies so remember that 'we are in a social formation; first see how it is stratified for us and in us and at the place where we are'. The intention is not, then, so much to discard notions of organisational forms, technologies as enduring or subjects having identities and to replace them with an ahistorical ontology of becoming, but to evaluate organisation, technology and the human in a particular way by examining how they are constituted and what forms they take.

Deleuze and Guattari (1988, 1994) provide a way into thinking about becoming organisation, becoming technology and becoming human as through and beyond a search for original being or identity. Others, notably Cooper and Burrell (1988) have been constitutive of such attempts in organisational analysis. Deleuze and Guattari's philosophical task is to cease treating becoming or multiplicity 'as a numerical fragment of a lost Unity or Totality or as the organic element of a Unity or Totality yet to come, and

instead distinguish between different types of multiplicity' and to work through the ontological, political and ethical implications of this by distinguishing 'between different types of multiplicity' (Deleuze and Guattari, 1988: 32). This means that the task of philosophy and politics is the construction of 'a non-contradictory, non-dialectical consideration of difference, which would not envisage it as the simple contrary to identity, nor be obliged to see itself as "dialectically" identical with identity' (Descombes, 1980: 136, quoted in Patton, 2000: 31).

3.4 Active and Reactive Forces and the Will to Power

Nietzsche (1968, 1994) sets out the cultural battle between different modes of evaluation in a post-theological age in terms of active and reactive forces or noble and slave moralities. In order to theorise what he considers the necessity of a new myth that can form the basis of a new politics, morality and ethics for the human condition (see Safranski, 2002), Nietzsche (1994: 21-27) discerns forces as either 'active' or 'reactive'. The difference between active and reactive forces is that:

In order to come about, slave morality [reactive force] first has to have an opposing, external world, it needs, physiologically speaking, external stimuli in order to act at all,—its action is fundamentally reaction. The opposite is the case with the noble method of evaluation: this [active force] acts and grows spontaneously (Nietzsche, 1994: 21-2).

Beardsworth (2001: 45) writes that, for Nietzsche, 'what is good is originally what is noble, that is, what discharges spontaneously, what is oriented towards the outside. The bad [that is, the reactive] in this schema constitutes that which blocks the path of this original affirmation'. In Deleuze's (1983) reformulation of Nietzsche, forces come in many forms: social, psychological, moral, biological, political, to name a few. These forces are relational in that they denote the potential for affecting others and being affected (affect is defined as 'the passage from one experiential state of the body to another and implying an augmentation or diminution in that body's capacity to act' (Deleuze and Guattari 1988:

xvi)), and here the concept of force is close to 'power' as a 'capacity' to do or be certain things and denotes an important aspect of force as power as nothing inherently objectionable, particularly when differentiated with domination (see Hindess, 1996). For Latour mediation is, as translation, the production of affects that are openings that do not simply replicate or transmit actions but are more like experimental forces that produce transformational and surprising effects. Gomart (2002: 521) suggests that force is related to mediation/translation, in Latour's (1994) sense of the term, which is a form of influence that is involved in the production of an affect when it is 'passed on' because it evokes (or fails to evoke) a capacity or competence in another. On the productivity of force, Gomart (2002: 521) quotes Zourabichvili (1994: 41):

[If you reduce] force to violence, [not only] do you not see that force exercises itself upon another force but you deprive yourself of understanding the phenomenon of affect, that is of a force which exercises itself upon another force less to destroy it than to induce it into movement. No doubt it is a 'forced movement' [rather than a voluntary one].... it is however a positive effect, which cannot be explained by destruction.

The production of capacities is also discussed by Deleuze and Guattari (1988) in terms of becoming and is illustrated by the mutual transformation afforded by the well-known example of the wasp and the orchid. This 'double capture' of forces of one assemblage by another illustrates how capacities occur through a mediation, 'a passing on', that does not, according to Patton (2000: 54), necessarily take place by weakening another. Deleuze with Parnet (1987: 2) write that 'the orchid seems to form a wasp-image, but in fact there is a wasp-becoming of the orchid, an orchid becoming of the wasp, a double capture since "what" each becomes changes no less than "that which" becomes. The wasp becomes part of the orchid's reproductive apparatus at the same time as the orchid becomes the sexual organ of the wasp'.

Gomart (2002: 520) makes a related point about the productivity of relational networks by using Foucault's notion of the 'dispositif' to demonstrate that 'techniques *grant* a self,

capacities, and intentions to the entity they delineate'. The power of the *dispositif*, say Gomart and Hennion (1999: 221), is that it constitutes new capacities and competencies. They quote Foucault (1975: 196) on the *dispositif* to make this point:

We must cease to always describe effects on power in negative terms: it 'excludes', it 'represses', it 'buries', it 'censors', it 'abstracts', it 'masks', it 'hides'. In fact power produces; it produces the real; it produces domains of objects and rituals of truth. The individual and our knowledge of this individual come from this production.

Gomart and Hennion (1999: 245) state that the *dispositif* focuses upon the conditions and means through which entities in relational networks come into existence. Here becoming as active force occurs from experimental activity with these techniques that 'grant' capacities and competencies. Deleuze and Guattari's life-long concern was to provide images of thought for becoming, multiplicity and difference in a manner that does not articulate it as an exceptional occurrence or refer back to an *a priori* and ahistorical identity.

Deleuze (1983) delineates Nietzsche's active forces as affirming and producing differences and, in distinction, reactive forces as negating and denying difference. It is the active that is the nature of things and that confronts organisation, technology and the subject as becoming rather than the force of the reactive conceived as identity. Reactive forces are, then, expressions of forces of 'adaptation, regulation and conservation' whereas active forces comprise of the power of transformation and the ability to 'impose forms onto the world' (see Patton, 2000: 60). In Nietzsche's terms, reactive forces occur when an *effect* of a force is understood as a *cause*—a point returned to below.

Nietzsche's concept of the 'will to power' is important for understanding active and reactive forces. For Nietzsche, the will to power, which is internally divided between active and reactive forces, gives priority to the expansive character of active force because this is *the* immanent principle through which organisation, technology and the human subject is to be conceived rather than one power amongst others. Contrary to much traditional political

thought (e.g., Hobbes's *Leviathan*), which equates power with domination, Nietzsche's will to power as a form of power 'refuses any perspective according to which the fundamental drive is to preserve or to increase the power of the body concerned' (Patton, 2000: 50). The will to power is, then, not about discharging energy in order to reach some kind of teleological end point or aimed at acquiring power to dominate others but rather the discharging of energy itself (see Beardsworth, 1996). It is in this sense, says Patton (2000: 52) that 'a certain stable or precarious but always reversible balance of forces will be established'.

It is Nietzsche's exposition of active and reactive forces that Cooper and Burrell (1988) suggest is so instructive for rethinking organisation analysis.¹¹ Despite the widespread usage of their aphorism the 'production of organisation' the Nietzschean character of their approach has passed without sustained scholarly analysis. Cooper and Burrell (1988: 92-3) trace the historical displacement of the 'object of organisational analysis' from 'a process in the continuing mastery of the social and physical environment' to 'organisation as a quasi-stable collection of things or properties'. This distinction between active forces as superior, a 'kind of prime energizer', from which human emerges and acts is counterposed to the inferior or reactive force that is representation and 'talking about' or representing *something*. It is these reactive forces that constitute a search for pure and ideal forms that pre-date the everyday world. Cooper and Burrell (1988: 101) continue that 'what we find at the so-called origin of things is not a reassuring state of perfection, now lost but still reclaimable; instead there is disparity, difference and indeterminacy'. The claim of perfect origins is replaced with a 'search for instabilities' that is a process of 'differential contestation'.

¹¹ The first move towards this Nietzschean-inspired organisational analysis is the recognition that organised activity is reactive and defensive, and that active force is superior. This entails a 'genealogy of system and

Deleuze (1983) argues that Nietzsche's philosophical project is marked out by a re-evaluation of the values of cultural phenomena and that it is the 'qualitative dimension of the will to power' as the expression of active forces that constitutes the potential for a genealogical re-evaluation of the present. Put more simply, difference, as active force, is the 'ground' of being as becoming and this posits an ethical position and normative stance. It is in this critical and creative sense, then, that normative values can be articulated against the particular quality of the will to power deployed, as either active or reactive, in a particular context (Patton, 2000: 60). Nietzsche, who is often regarded as the seer of postmodernism and equated with the contention that all perspectives are somehow equivalent, rejects out of hand the claim that all truth claims are subjective, to the extent that it is the quality of forces that is taken as the basis for positive or negative evaluation. The surrogate for truth and hope articulated by Nietzsche, in contrast to liberal versions of postmodernism and conventions of critical thinking, resides not, then, in the organisation, technology or subject as such, but in the approach to them. In other words, the manner in which phenomena are evaluated and the implications that are drawn from this evaluation. Patton (2000: 62-3) states:

[T]his is not the moral form of critique which judges against what should be, rather it is a genealogical critique which judges what is by determining the quality of the forces present and their affinity with one or other character of the will to power. The result is a complex and nuanced system of judgement.

The evaluation of phenomena is not, however, reducible to an interpretative act of a socially organised community but is rather like ongoing experimentation that attempts to bring out the quality and mixture of forces, some of which are non-human forces. Latour (2000: 372) provides an example of how this Nietzschean form of evaluation might proceed:

organisation [that] begins ... from a more fundamental process of materiality and energy' (Cooper and Burrell, 1988: 105; see also Patton, 2000: 65-67).

Speaking of her new study of sheep [Thelma Rowell] stated one of her 'biases'.... 'I tried to give my sheep the opportunity to behave like chimps, not that I believe that they would be like chimps, but because I am sure that if you take sheep for boring sheep by opposition to intelligent chimps they would not have a chance'.... By importing the notion of intelligent behaviour from a 'charismatic animal' ... she might modify, subvert, elicit, in the understanding of sheep behaviours features that were until then invisible.... It is because she artificially and willingly imposes on the sheep another resource coming from elsewhere that 'they could have a chance' to behave intelligently (quoted in Gomart, 2002: 522).

Gomart (2002) argues that what is required is a form of engagement which differentiates between different kinds of force and identifies those which 'induce into movement'. She terms these kinds of forces or inducements 'generous constraints' because they can surprise the experimenter. Nietzsche terms generous constraints 'active forces' and 'giving sheep a chance to behave differently' marks an engagement with the particular quality of force that it has been suggested above Nietzsche (1994: 22) wishes to privilege.

Nietzsche also describes this selective concept of being as becoming as the 'eternal return'. For Deleuze (1983: 48) this means that it is returning itself 'that constitutes being insofar as it is affirmed of becoming.... identity in the eternal return does not describe the nature of that which returns, but, on the contrary, the fact of returning for that which differs'. In this sense evaluations reflect the quality of forces, either active or reactive, and can be judged normatively through the quality of forces deployed. Deleuze and Guattari's (1988) approach to evaluation is similarly partisan and gives priority to what they variously term 'lines of flight', 'deterritorialisation' and 'becoming-minor' through processes described as 'rhizomatic', the 'body without organs', and the 'plane of consistency'. This does not mean however that reactive forces, in the sense of organisational practices and routines, are unimportant or do not return or repeat themselves, but 'rather their returning involves a becoming-active.... The eternal return of reactive forces involves a contradiction; reactive forces cannot return, where returning names the being of becoming, simply because they have not begun to leave themselves, they want to remain what they are' (Ansell Pearson,

2000: 201). This privileging of the quality of active force is, then, premised on a partisan concept of the being of organisation as a becoming organisation and, as Patton (2000: 65) observes, is no less moral in its consequences than the dominant traditions of Western philosophy that privilege being as unchanging identity.

3.5 Quantitative and Qualitative Multiplicities and *Durée*

Bergson (1983, 1991, 2000) is similarly interested in re-evaluating the philosophy and politics of being and becoming through multiplicity and difference (see also Ansell Pearson and Mullarkey, 2002). Bergson's philosophy is premised on the proposition that the lifeworld cannot be characterised as Cartesian but is rather characterised by the inseparability of the mind, body and world (see, for example, Bergson 1991). This forms the basis of his connectionist proposition of the absolute continuity or immanence, which Deleuze and Guattari (1994) term 'the plane of immanence', between the human subject and matter. There are, for Bergson, only differences in degree between human perception and the heterogeneity of matter.

Bergson (1991: 9-10) suggests that philosophy often gets into difficulties because of concepts associated with matter. The reduction of matter to perception is a mistake as is the idea that matter can produce perceptions. For Bergson, matter is described as 'an aggregate of 'images'. And by 'image' we mean a certain existence which is more than that which the idealist calls a representation, but less than that which the realist calls a thing—an existence placed halfway between the "thing" and the "representation"'

These classic antinomies relating to representations and matter are problematic for Bergson as they are either 'now idealistic' or 'now realistic'. They are 'badly analysed composites' in Deleuze's (1988: 28) terms to which the appropriate response is not an attempt to resolve the problematic they set up but to do something different with its mutual disappointments.

From the assumptions of monism and immanence, Bergson argues that human consciousness is not representational. Rather the 'qualities of the world that we experience are not the qualities of miniature representations inside our heads ... they are qualities of the world itself' (Watson, 1998: 6) and thus perception puts the human subject into matter not external to it (see Deleuze, 1988: 25). The interpenetrating relation of perception and matter is central to Bergson's philosophical approach because it is the selection of 'matter forces' appropriate to the requirement for practical action that constitutes a 'cerebral volume' or 'zone of indeterminism'. It is this 'zone of indeterminism' for Bergson that denotes the potential of ethical evaluation and becoming organisation, becoming technology and becoming human, although this indeterminacy cannot be conceived outside of what he terms *durée*, which is a relation of matter and memory in which memory is not reducible to psychological recollection.

Nietzsche's emphasis on active forces has parallels with Bergson's concern with *durée*. Bergson's difficult concept of *durée* is his response to the dissatisfactions of idealism, realism and what he understands as an 'intellectualist' impulse (see Tsoukas and Chia, 2002). Like Nietzsche, Bergson is similarly concerned with the manner in which phenomena is evaluated and his concept of *durée* provides a way of approaching phenomena in a different way. *Durée* is articulated through the distinction between temporality as *temps*, which is time understood in spatial terms, that is to say, time as chronological, abstract and concerned with quantity. Tsoukas and Chia (2002: 571, emphasis added) suggest that time as *temps* marks out 'our readiness to transform the perceptual order (what our senses apprehend) into a conceptual order (making sense of our experience through concepts). The trouble with concepts ... is that they are discontinuous and fixed, and, as such, *unable to capture the continuously mutating character of life*'.

Time as *temps* is an intellectualist resource for practical action where what is perceived is what is necessary for calculative action and from which embodied and contextual experience is neglected or missing. Time as *durée*, in contrast, is qualitative, embodied and situated and thus does not comprise of putting together discrete units of time. Bergson (1991) goes as far as to argue that time as *temps* is incapable of grasping the real facts of time and that it is in fact more a manner of speaking than the reality of temporal experience. Situated and contextualised time as *durée*, by contrast, is an indivisible limit between past, present and future that is made up of sensual and embodied experience from which time as a series of quantitative moments is plucked (see Chia, 1999: 216).¹² *Durée* is an ever-changing process of differences in kind without beginning and end from which the heterogeneity that is the ground of becoming human is actualised in perception. It invokes, then, a permeating flow of activity that is 'above the turn' of human condition's tendency to conceptualise thought and utilitarian action. For Bergson, *durée*, which emphasises qualitative differences and particularity, is perceived rather than conceived through 'intuition'—something I return to later. It is in this sense that Bergson's *durée* as multiplicity echoes Nietzsche's eternal return as the being of becoming and an approach that places emphasis upon active forces.

Bergson's elaboration of quantitative and qualitative difference elaborates an approach to time in spatialised or intellectualist terms (i.e., discrete past, present and future) and time as *durée*. Spatialised temporality is equated with quantitative differences or differences in degree between perception and matter, and time as *durée* with qualitative differences or differences in kind between matter and memory (also termed actual and virtual multiplicities by Deleuze, 1988). In positing differences in degree as relations of matter and

perception and differences in kind as relations of matter and memory, Bergson and Deleuze have a very particular concept of memory which is memory as *durée* or put another way as a virtual multiplicity that is a heterogeneity that has its own particular ontological status. The critical and creative concern here is to reformulate the contemporary understanding of time so that becoming organisation, becoming technology and becoming human is *of* time rather than *in* time, a concern similarly articulated by Nietzsche's eternal return of difference. In this important sense Nietzsche, Bergson and Deleuze each 'conceptualises time as becoming, as an opening up which is at the same time a form of bifurcation or divergence. Each conceives of *time as difference*' (Grosz, 1999: 3-4).

Perception or consciousness occurs for Bergson when particular aspects of the world are selected or 'actualised' that are relevant to the human condition. Deleuze (1988: 25) writes that from this 'cerebral interval, in effect, a being can retain from the material object and the actions issuing from it those elements that interest him ... [but] it is not an object plus something, but the object minus something, minus everything that does not interest us'. This 'minus everything' is the virtual multiplicity that nevertheless remains real as the 'totality of impressions, impulses, sensations, possible actions and utterances, ... [in fact] our body is awash with forces that never quite make it to consciousness' but nonetheless affect our behaviour in concrete ways as the 'virtual field of energy traversing and binding the connectivity of the social ... that is immanent to this non-human fabric of the "virtual"' (Watson 1998: 7-8). Bergson's target here is to problematise a psychological conception of memory (see Ansell Pearson (2002: 167-205). This entails an enlargement of perception in order to make visible 'forces that are ordinarily imperceptible.... Although invisible forces—molecular affections and perceptions—are not time they are intertwined with its

¹² For Bergson, *durée* is understood as a qualitative multiplicity, which is 'an internal multiplicity of succession, of fusion, of organisation, of heterogeneity, of qualitative discrimination, or of difference in kind; it is a virtual and continuous multiplicity' (Deleuze, 1988: 38).

passages, intervals, echoes, and tunnels' (Deleuze 1998: 72, quoted in Ansell Pearson 2002: 171). For Bergson, reducing the past to psychological recollection corrupts 'the past' because it renders an ontology of the past as a virtual multiplicity inoperative.

Developing an ontology of the virtual that overcomes the problems Bergson associates with psychological recollection requires dispelling therefore 'a number of illusions, a crucial one being that memory only comes into being once an actual perception has taken place' (Ansell Pearson, 2002: 174). In other words, the illusion is that the past only comes into being once it has been retrospectively constituted in the present. Memory conceived as differences in degree is here a diminished conception of memory that cannot go beyond psychological recollection because 'the difference between perception and memory is simply one of intensity or degree, in which the remembrance of a perception is held to be nothing other than the same perception in a weakened state' (Ansell Pearson, 2002: 175). Perception requires the 'powers afforded by memory', which means granting an ontology to memory, that is to say, its own particular being which comprises of differences in kind. For Nietzsche the identity of what returns eternally is not prescribed in advance because it is the returning of time not something in time, that is to say, the time of virtual multiplicity, that returns.

Ansell Pearson (2002: 179) continues that Bergson gives the being of the past 'an extra-psychological range' and that 'which is not actually lived and no longer active may cease to belong to consciousness without thereby ceasing to exist'. This means that the human condition is one through which we do not simply live the past again through better or worse recollections (with, say, more comprehensive archives), that is, 'it is not a question of rendering actual what is simply virtual and making the two identical' because 'being is always of the order of difference' and memory is a virtual multiplicity that is 'a movement of differences and time' which by its nature denotes the impossibility of equivalence

between the virtual and the actual (Ansell Pearson, 2002: 176). It is with this conceptual move to problematise memory as psychological recollection that Bergson and Deleuze invoke memory as the ontological ground of becoming and change as the movement of differences in kind that do not refer back to *a priori* identities. The implication of this is that if the virtual, as an immanent ontological totality of the past, is not a former present then this begets a future which is not simply a future of the present: to think in terms of the ontology of the virtual is constitutive of Bergson's motivation to construct an approach that works beyond what he considers the pragmatic and utilitarian tendencies of the human condition. In other words, with memory conceived as an ontology of difference rather than a psychological recollection the critical and creative task that sustains Bergson, but also Nietzsche and Deleuze, is made clear: to salvage the human condition from determinism and redeem contingency for the future through the heterogeneity of the virtual.

It is becoming, divergence or 'difference differing' that is the key to understanding how and why Deleuze takes up and extends Bergson's ideas and how this conjoins with his concern with Nietzsche's notion of active and reactive forces. It is also Heidegger's 'secretive goings-on' discussed in Chapter 2. In terms of an approach to information and communication technologies it marks out an understanding of technologies not as *a priori* fixed artefacts used in different ways in different contexts (i.e., as a series of possible uses in different contexts—this would be the domain of psychological recollection) but more radically as open-ended devices whose relational identity differs across times and places: not so much, then, the same technology in a different context as differing technology in a differing context. Deleuze (1994: 40-1) writes that the condition of a virtual ontology can 'be satisfied only at the price of a more general categorical reversal according to which being is said of becoming, identity of that which is different'. Instead of the dominant Western philosophical tradition of being first and becoming second, being is associated

with a second principle that revolves around difference differing. For Deleuze this amounts to nothing less than the fourth blow to the human subject after the Copernican, Darwinian and Freudian revolutions. Difference now has its own ontological status from which being is constituted of becoming: multiplicity is no longer conceived as an adjective.

3.6 Purifications, Mediations and Transformations

Nietzsche, Bergson and Deleuze share, I have suggested, a concern with a philosophy and politics of becoming, multiplicity and difference. Given this it is not surprising to find that they have been subject to similar criticism: Nietzsche for reducing the human condition to the discharging of biological or individual 'instinctual' forces (see Lash, 1990), Bergson for positing a subjective or religious-cum-mystical notion of *durée* (see Game, 1997) and Deleuze for deploying becoming as 'pure' difference (see Badiou, 2000). The general critique of their concepts is that a dualism is posited between force, memory or difference as *a priori*, and social, political and historical formations as epiphenomenal, that is to say, they reverse the dominant tradition of being and becoming but leave its general hierarchy intact. Engaging with these critical comments means setting out how the relationship between active and reactive forces, memory and perception and virtual and actual is more nuanced and complex than is often portrayed and it also means 'overcoming lazy and self-satisfied appraisals' of concepts which 'guarantee only sad encounters are produced' (Ansell Pearson, 2002: 8).

Nietzsche has been associated with attempting to construct a human subject that expresses active forces in an unabashed fashion above 'man and mountains'. Beardsworth is similarly concerned with the potential re-enactment of a dualism between active and reactive forces, with active forces becoming a new orthodoxy of forces outside cultural and historical differentiations. For Beardsworth (2001: 47) the focus on active force means risking 'a

move back to the “original” valuation, the original noble valuation. At such moments the active destruction of metaphysics (“active nihilism”) becomes a pure regression to the fiction of spontaneous discharge’ for forces. In countering this, Ansell Pearson (1991: 120) argues that, for Nietzsche, the categories that produce organisation, technology and subject *come out of an ordering that does not precede the world* in a straightforward sense and cannot be demarcated into an *a priori* distinction of nature and culture.

Ansell Pearson (1991: 120) argues that *contra* critical theorists such as Habermas (see also Chapter 2, Section 2.6.2), who claims that Nietzsche posits a primary and ahistorical nature, it is the eighteenth century French Enlightenment thinker, Rousseau, rather than Nietzsche who betrays a desire which ‘represents a search for origins which will validate the “original” in history as being more authentic because it is, in some fundamental sense more “natural”’. It is, he continues, Rousseau who endows human subjects with a natural and individualistic goodness in which the ambition of society can only be realised by the free choice of subjects who decide to join society and submit to its rules and regulations. Despite ‘man’s natural goodness’, then, the lack of a higher moral society requires careful cultivation in order for his vision of society to be brought into existence. For Lee (2001), who examines being and becoming in terms of the politics of childhood, the dualism between natural goodness and potential higher morality in civil society is the Enlightenment expression of the *a priori* gift of freewill or agency to humankind from God. Human becoming occurs between the good but incomplete nature and the education of the human into a moral being. In this sense ‘Rousseau’s mythic “nature” does its work before the work of culture, cultivation and education, and leaves humankind before socialisation begins. If culture is the supplement to nature, then culture and nature would seem to work at different times’ (Lee, 2001: 112). For Rousseau, human becoming, and thus the possibility for good and bad freewill, is delimited to the space and time *between* nature and

culture rather than *out of* the mediations between nature and culture (see also Callon and Law, 1995; Gomart and Hennion, 1999).

Yet as Ansell Pearson (1991) remarks, Rousseau's solution to the problem that all societies face, that is, determining what is natural and cultural and where human becoming or, better expressed, becoming human takes place remains more ambiguous than it might seem at first glance because Rousseau writes that a state of nature 'no longer exists, perhaps never did exist, and probably never will exist' (quoted in Ansell Pearson, 1991: 55). Rather Rousseau's state of nature, Ansell Pearson continues, is conceived in philosophical terms as a 'legal fiction' *and* as an actual historical condition that precedes civil society. By contrast, Nietzsche's genealogical approach, as a history of the present, comprises no such ambiguity as 'only that which has no history can be defined' (Ansell Pearson, 1991: 56). Here the human condition cannot be rendered into an *a priori* and pre-given division between the incompleteness of nature and the completing role of culture. Rather the particularity of, for instance, a technological device or the human subject is constituted by incorporations and interdependencies that construct the potential or capacity to act and be acted upon through assemblages that extend, supplement and delimit capacities to discharge, defer and transform effects (see Nietzsche, 1994: 38-40).

Bergson has similarly been charged with reducing the human condition to lived experience and psychological subjectivism, particularly with an alleged 'mysterious' notion of *durée* (Game, 1997). Although the contention of psychologism is more warranted in earlier writing, says Deleuze (1989: 82-3, emphasis added), 'increasingly, he came to say something quite different: the only subjectivity is *time*, non-chronological time, grasped in its foundation, and it is we who are internal to this time, not the other way round.... Time is not interior to us, but just the opposite, the interiority in which we are, in which we move, live, and change' (quoted in Ansell Pearson, 2002: 184). Put another way the human

subject cannot be assumed to be *a priori* given or 'ready to hand', even to itself rather there is a temporality of becoming human or becoming organisation that is an immanent virtual multiplicity. For Bergson, in particular, it has been suggested this virtual multiplicity means going beyond the inadequacies of perception and recollection. But importantly this 'enlargement of reality' is not transcendent to the human but rather an opening up to the immanence or continuity of becoming human that is the virtual multiplicity.

Bergson and Deleuze articulate this immanence through the pairings of 'virtual and actual' and 'possible and real', with the distinction between virtual and actual understood as *durée* and *temps* respectively, and the virtual and actual made distinct, in turn, from the possible and the real. The virtual and actual denotes contesting the proposition that for something to be real it must be comprised of a preceding possibility. In place of this, says Ansell Pearson (2000), constructing the 'radically new' necessitates the recognition that even possibility (i.e., essentialist identity) is constructed. This is why for Deleuze (1994) there is such a grave danger in confusing the virtual and the possible. The realisation of the possible is comprised of resemblance (i.e., a good or bad copy) and limitation (i.e., the narrowing of possibilities) and this makes the relation of the possible and the real one of conceptual equivalence (see Deleuze, 1994). Here the possible is 'both more and less than the real. It is more, insofar as the real selects from a number of pre-existing possibilities.... But it is also less, insofar as the possible is the real minus existence' (Grosz, 1999: 26). Deleuze (1988: 98) suggests that the 'sleight of hand' at work here is that 'the real was expected to come about by its own means' and this means that 'it was possible at any time before it happened'. This is, for Deleuze, a 'projection backwards' or 'mirage effect' of the possible pre-existing the real but which is in fact constituted after the real. The philosophical and political implications of overturning the notion of possible and real cannot be overestimated for Deleuze because 'the possible' delimits the future by effacing its retroactive constitution

as possibility and, thus, relegates the creative potentiality of the human condition to a secondary role. In Nietzsche's terminology this is to make the serious error of conceiving of something as a discrete cause that is in fact a relational effect.

The virtual is immanent to the actual and induces actualisation, and as such the virtual 'possesses a full reality by itself. The process it undergoes is that of actualisation' (Deleuze, 1994: 211). Actualisation is produced as an effect rather than restricted or contained within a subset of causal possibilities. Because the virtual, as an ontological multiplicity, is immanent but does not resemble the actual which diverges from the virtual, actualisation is understood as constituting genuine newness. The movement between the virtual and the actual, then, 'requires a certain leap of innovation or creativity, the surprise that the virtual leaves within the actual.... The movement of actualisation is the opening up of the virtual to what befalls it' (Grosz, 1999: 27). The realisation of the possible is an acontextualist approach as possible realities are already given, whereas actualisation, by contrast, is situated within particular a assemblage of relations in which the virtual simultaneously exists and threads the actual away from the current context; it denotes a concern to give proper analytical legitimacy to notions of transformation and emergence of context and content.

The concept of situated action (Suchman, 1987; Hutchins, 1993; Heath and Luff, 2000) goes some way toward virtual multiplicities although, as already suggested, the concept of the virtual means more than experienced judgement in relation to particular contexts (see Flyvbjerg, 2001; Chapter 9 for a critique of situated action). The virtual marks out the indeterminacy and open-ended character of content and context—it is not same object in a different context nor a different object in the same context. Ciborra (1999) describes how technological objects, human actions and boundaries get 'lifted out' of routine activities and reordered by 'improvisation', that is to say, plans and procedures must be made to

work in particular contexts. Ethnomethodologists such as Suchman (1987) have long established the accomplished character of organisational routines which are ‘up for grabs’ as they are elaborated on an everyday basis. Importantly, Ciborra, who references Bergson, pushes this analytical point further, arguing that improvisation marks out something fundamental to existence; it is, in other words, more than the differential use of artefacts to make them work in particular contexts in which they are deployed. Improvisation is more than decision-making with judgement or calling on the resources of previous experiences as ‘vast regions of the past are enacted at that very moment’ (Ciborra, 1999: 86-91). Echoing Nietzsche and Bergson, Ciborra draws upon Heidegger’s notion of *Augenblick* (the blink of the eye) to denote a ‘moment of vision, that is a movement in which our Being is conscious of itself and its possibilities vis-à-vis the world, rather than being dispersed in the ordinary chores and interests of everyday life’. The actualisation of the virtual is, then, to create divergent lines which correspond to—without resembling—a virtual multiplicity. In order to make the virtual and the actual distinct from the possible and the real Deleuze (1994: 209-11) sets out the relations between the virtual and the actual as a two-fold movement comprised of differentiation (see also Patton, 2000: 38). First differentiation is associated with problematisation (in the sense meant by actor-network theorists). This can also be expressed as making something determinate or visible by constituting the context and content of a particular task to be performed or problem to be solved (for empirical detail see Chapter 6). Second, differentiation is making something different from a particular problematisation in ways which may resemble the task at hand but is not conditioned by or reducible to differentiation (for empirical detail see Chapter 7). It is this immanent but irreducible connection and movement between virtual and actual that means that contexts, boundaries and the content of technologies and identities are ‘up for grabs’.

Bergson and Deleuze are concerned with providing the actual with more 'life' than is visible in the actual (Ansell Pearson, 2000). This is comprised of the inducement into movement between virtual and actual multiplicities and this means 'threading' socio-historio-technical phenomena towards the virtual (see Deleuze and Guattari, 1994: 122). Ansell Pearson (2000) argues that those who are critical of the concepts of active forces, *durée* or virtual multiplicities usually neglect this immanent relation between virtual and actual. Instead there is a desire to know whether forces, differences, multiplicities are either 'of this world' or 'from outside of it' in order to make the accusation that becoming is a mysterious and transcendent phenomenon. This is an illusion, Ansell Pearson (2000) continues, that requires continual exposing because active forces, *durée* and virtual multiplicities are not transcendent to the human condition and must be understood as 'neither inside nor outside the world'. Rather forces, multiplicity and difference (which includes social, historical and technical mediations and purifications) become *with* the world and as such the world exists as a becoming human or 'becoming world' made up of these forces.

Beardsworth (1996, 1998, 2001) makes a similar argument about becoming in terms of the mediated organisation of forces. For Beardsworth, active and reactive forces come out of a mediated history from which distinctions and purifications between the social, the organisational, the physiological, the psychological and, in particular, the technical emerge in the first place. In this important sense, then, forces are posited as immediately beyond *a priori* 'instinctual forces' conceived as asocial or ahistorical. The human condition, according to Beardsworth, is constituted by the right to make promises, to defer action in time and space and the ability to transform the future through a genealogy of the present. Nietzsche (1994: 39) writes that in order to be able to discern the future

man must first have learned to distinguish between what happens by accident and what by design, to think causally, to view the future as the present and anticipate it,

to grasp with certainty what is end and what is means, in all, to be able to calculate, compute—and before he can do this, man himself will really have to become *reliable, regular and automatic* ... so that he, as someone making a promise is, is answerable for his own future!

Here Nietzsche describes the process of becoming human as occurring through and beyond calculability, repeatability and arrangement. For Beardsworth (2001: 48-56) this 'humanisation' comes out of the *non-human* transformations invoked by technics. The will to power, then, denotes not the arbitrary discharging of the will outside of the social, historical or technical, but expressive action that is conditional on, and emerges out of, willing the necessity of the capacities of the human as non-human from the first instance. It is, then, this re-evaluation of the human condition that also evokes active forces, *durée* and virtual multiplicity.¹³ Nietzsche is, as set out above, not simply against notions of organisation, calculation or identity as such, but is against a particular approach to phenomena understood in terms of the reformulation of all forces into active forces. This is not, then, the death of notions of enduring organisational practices or the human subject as a becoming that is effaced by effects conceived as foundational causes. Organisational practices and the human subject are in fact the precondition for becoming organisation and becoming human in so far as it is evaluated as an effect that thus invokes the active will to power. Put another way the illusion is not that the human subject exists or not but rather the illusion is that particular subject effects are ahistorical, asocial and atechanical and conceived as *a priori* causes (see also Law, 1998).

May (1998: 15-17) also problematises the association of active force and suggests that what is required is a more nuanced form of judgement that does not simply pit active and reactive forces against one another but examines their reciprocity yet irreducibility to each other. Positing reactive forces as 'illusory' or 'false' and active forces as 'primary' is sustainable only to the extent that these are illusions or falsifications because they are

approached through a reactive form of judgement, that is, delineates relational effects into foundational causes. For May (1998: 37) this means that evaluations cannot occur in the abstract and that, for instance, pity

is bad when, *inter alia*, it has the 'insane' aims of abolishing suffering—insane because suffering is inseparable from living, because suffering is in large part, both cause and effect of our growth in power and creativity and 'sovereignty'.... By contrast, pity is good when it has the 'converse' object: namely, those who resist suffering, those who cannot bear to be (or to witness others being) 'broken, forged, torn, burnt, made incandescent, and purified'. Something is fully a value only if it is specified in terms of the functions (and the motives they express) in the life of a particular type of individual.

This motivation toward evaluating pity, but which is applicable to cultural forms generally, is also Bergson's notion of intuition as an 'enlarged reality' (see Mullarkey, 1999). For Bergson 'intuition' is not a spontaneous or subjectively embodied experience but a 'supra-intellectual' competency that comes out of the effort and attention directed toward 'the detail of the real'.¹⁴ It is in attending to the processes that constitute, for example, dichotomies that invokes intuition in the intellect, the virtual that unravels the actual or differences in kind immanent to differences in degree (Mullarkey, 1999: 159-60). This is, similarly, why Nietzsche (1974: 85) remarks that 'the growth of consciousness may be danger' to 'instincts' but to the extent senses show becoming they do not lie. Instincts are understood here not as *a priori*, psychological or ahistorical forces but as Bergson's intuition that comes out of a practice that approaches the condition of organisation, technology or the human subject through a genealogy of the present: it is in this sense, through and beyond the present not against it, that Nietzsche writes of 'incorporating knowledge and making it instinctive'. Reactive forces, time as *temps*, actual multiplicities are the 'scars of the past' but 'even here, and especially here, the reconstitution and

¹³ Colebrook (1999: 121) similarly remarks that articulating the denial of the will to power through a genealogy of the effacement of effects invokes active forces and returns a cause to a relational effect.

¹⁴ Deleuze (1994) terms this 'superior empiricism'. See Ansell Pearson (2002: 170-4); Mullarkey (1999: 158).

working-through of the past calls upon an art of existing ... in which these scars bear their own fruit' (Ansell Pearson, 2002: 195).

The proposition that reactive forces are necessary 'illusions' or 'falsifications' is further complicated because although becoming organisation, becoming technology and becoming human are expressions of active forces, reactive forces provide something to 'become otherwise' and engender the expression of active forces. As noted earlier, 'a becoming world' is made up of mediations and purifications of social, organisational, historical and technical forces. This is another way of expressing the mediated history of becoming in which 'pure' active forces, if such unmediated forces were possible, would be an expression of forces that would remain crude and unreflective:

Nietzsche interestingly suggests that slavish traits [that is, reactive forces] are crucial to motivating it [that is, active forces, becoming].... For the slave's feeling of vulnerability, the gnawing question mark he (in contrast to the master) places over his identity and power, and his restless dissatisfaction with his lot, can all provide decisive impetus to the highest realms of thought and art and self-mastery.... He, unlike the master [that is, active forces], is a painful problem to himself; and in his search for relief from the pain and for a solution to the problem he is driven to feats of thought, imagination, self-discipline, and artistry for which the self-assured master simply lacks comparable motivation (May 1998: 46-7).

In order to analyse organisation, technology and the human subject each must be approached as always a composite of reactive and active forces such that neither can be equated with becoming alone: active forces or virtual multiplicities cannot be understood as only coerced into reactive forces or real multiplicities because they are constituted through a mediated history that is social and technical. Similarly Beardsworth (2001: 50) argues that forces are not simply active or reactive because forces are radically unstable and mutually defining and as such 'the categories against which Nietzsche sets much of his thinking—causality, finality, purpose, the subjectivity of the will—are the result of a long process that designates the human as such and therefore designates them *as also* active' through a becoming human that is a constitutive technics (see also Brigham, 2001).

Mullarkey (1999) similarly elaborates the importance of mediations, purifications and transformations with regard to Bergson's later writing and terms this the 'circle of quality and quantity'. Bergson changes his emphasis over time, Mullarkey (1999: 143) argues, from actual multiplicities revealing virtual multiplicities to a relation in which 'quantity seems to subtend quality' and that 'sometimes a difference in degree can be so immense that it creates a difference in nature'. For Mullarkey relations of virtual and actual or quality and quantity are, despite irreducibility to one other, mutually reciprocal. Bergson's immanent and irreducible 'internal division' of quality and quantity is also Patton's (2000) description of the 'internal complexity' in Nietzsche's concept of active and reactive forces. For Patton (2000: 63) 'active forces may become reactive, and acquire an affinity with the reactive rather than the affirmative quality of the will to power, or the possibility that reactive forces may become active and acquire an affinity with the affirmative dimension of the will to power'. The implication of this is that the particular meaning and evaluation of a given phenomenon requires the 'patient and meticulous practice of genealogy' to produce a 'becoming otherwise'.

3.7 Philosophy, Politics and Organisational Analysis

The relationship between being and becoming has been fundamental to philosophical and political thinking in the Western imagination. The previous section set out how it makes little sense to talk of being and becoming outside of constitutive purifications, mediations and transformations and how the oppositions and reversals between being and becoming must be returned to their particular social and technical history in order to be thought anew. In relation to this, these concluding remarks restate two key points made in this chapter: first, the importance of evaluating phenomena in a particular way, and second, how the relationship between the philosophy and politics of being and becoming can be understood.

This chapter has argued that for a philosophy and politics of becoming organisation, becoming technology and becoming human to be meaningful it must comprise of more than a simplistic reversal of the relative priority of being and becoming and the association of becoming with changes in contemporary capitalism. The conclusion that Chia (1999), one of the key exponents of process philosophy in organisational analysis, reaches contrasts to the approach developed in this chapter. Chia (1999: 225) concludes that ‘merely relaxing the deeply entrenched organisational and institutional habits, which keep “organisations” together and which enable them to be thought of as “thing-like”, is itself sufficient to allow change to occur of its own volition. It is this “hands-off” attitude towards organisational change which is the implicit advocacy of this process metaphysical mindset’. More recently, Chia (2003: 111) remarked that ‘social reality is always already an abstraction from the brute reality of our pure empirical experience ... what remains absolute is the immediacy of our unthought lived experience’. I have argued that such a conclusion reveals a desire to separate phenomenal experience, to ‘let experience be’ outside of social, organisational, political and historical forces and mediations, and that this position cannot be sustained by examining process philosophy-inspired thinkers such as Nietzsche, Bergson and Deleuze. This chapter has argued that in contrast to Chia’s reductionist associations what is critical and creative is the way in which evaluation of becoming takes place rather than becoming *per se*. Put another way, instead of situating critical analysis as either for or against being or becoming a genealogical approach is orientated toward an evaluation that is *through and beyond* the dualism of being and becoming to an account of the work of mediation, translation and purification.

Given the argument set out in this chapter, the contemporary emphasis on becoming in social and organisation theory requires problematisation because it is bound up with two Procrustean tendencies. First, novel philosophical concepts relating to the relationship

between forces, differences and multiplicities are rendered subtly complicit with the restructuring of contemporary capitalism around a knowledge economy and a narrowing of 'becoming organisation' into flexible network forms, 'becoming technology' as new versions of software (first/second generation programs) and 'becoming human' as self development. Second, emphasis on becoming as the basis of contemporary experience of advanced capitalism is often discerned as meaning being against historical legacies and outmoded forms of economic arrangement or social interaction. *Contra* these one-dimensional depictions this chapter has argued that Nietzsche, Bergson and Deleuze are not in any sense straightforwardly against entities such as organisational forms, technological objects or human subjectivity as either proactive or defeatist. Neither are they interested in invoking multiplicity or difference as some kind of unfettered ode to spontaneity.

I have argued that the task of philosophy for Nietzsche, Bergson and Deleuze is to think beyond the human condition. Their approach is not however concerned with providing a critical analysis based upon dismissing or rejecting the uses and abuses of the philosophical concept of becoming as evidence that the term is empty and not worth analytical attention. In this sense critical approaches are characterised by contesting becoming and examining whether it can be empirically accounted for and how far it is representative of the alleged emergence of a post-Fordist knowledge economy. Although critical approaches are valuable, in Nietzsche, Bergson and Deleuze's terms such approaches bring about an intensification of the contested 'problem of becoming' rather than 'problematizing becoming'. In their terms this is restrictive because it creates a dependence upon a form of critique that simultaneously and paradoxically sustains 'becoming' as an object of analysis. The way in which phenomena are evaluated is not, then, to use Deleuze and Guattari's broad cultural metaphors, reducible to the either/or choice between the arborescent tree as 'being' or the liberatory rhizome as 'becoming' as there are knots of arborescence in

rhizomes and rhizomatic stems in roots (see also Chapter 2, Section 2.9). The task at hand is, instead, to put thinking on its way with an approach that overcomes the choice between being and becoming through a form of analysis that articulates the way in which relations are continually in construction, being extended or are collapsing, or comprised of offshoots that are falling apart or starting again. This is not a new or different dualism, say Deleuze and Guattari (1988: 20), it is rather a 'problem of writing: in order to designate something exactly, an exact expressions are utterly unavoidable.... We invoke one dualism in order to challenge another. We invoke a dualism of models only in order to arrive at a process that challenges all models'. It is, for Deleuze and Guattari, a call to experiment—to produce new images of and for thought and practice.

The turn to a relational ontology, now established within the social sciences, marks out the constitutive role of the distribution of technics, practices and discourses in 'becoming organisation', 'becoming technology' and 'becoming human' but there remains a question of how to account for the experience or persistence and institutionalisation of effects. This chapter has argued that becoming organisation and becoming human cannot be understood outside of a social and technical affective history of translations, purifications and mediations and these relational effects are set in motion by techno-scientific, economic-administrative and political economy assemblages and that these assemblages are deployed and possess organisations, technologies and subjects in different ways in different places and times. This necessitates an approach that analyses the minutiae of how affects constitutively construct becoming human, becoming organisation and becoming technology but also how circulating effects come out of relationality and become capacities or incapacities that belong to the particular subjects, organisations or technologies. Lee and Brown (2002: 277) illustrate this through the example of a small child who becomes traumatised by fear during a 'frightening' theatrical performance. They suggest that the boy

becomes capable of a possessing 'persistent memory of fear by virtue of his peculiarity as a child'. From this they argue that there is a sense of a possessive human condition in which the task of responding, discharging or disposing of affects falls upon a particular subject alone. In addition, incorporating and responding to affects is 'a job for which we may all, at times, be singularly ill equipped'. It is, then, the incorporations, deferrals and dispersions of assemblages that marks the human condition as irreducibly becoming *and* being, relational *and* possessive, and organisations as proximal *and* distal (see Parker and Cooper, 1998).

In conclusion this chapter has attempted to demonstrate that the connections and complicities between philosophical concepts and contemporary politics in relation to being and becoming remain under-theorised and under-developed in social and organisation theory: multiplicity, becoming, difference each require ongoing ontological, political and ethical work (see Chapter 9). This chapter has argued that the relationship between the philosophical and the political should be characterised as an open-ended, temporary and ongoing resolution of tensions between concepts, discourses and practices, and that it is this relationship that constitutes the potential for complicity and indeterminacy. In terms of specifying the relationship between being and becoming it means that once this connection is made between politics and philosophy it becomes incumbent to articulate thinking and acting through a genealogy of present dichotomies. This genealogical approach, an evaluation 'from within', necessitates the detailed examination of how disjunctions and connections between being and becoming are constructed and consolidated as a condition for their re-evaluation. In constructing a way through and beyond current antinomies, thinking the philosophical and the political means invoking the contemporary expressions of being and becoming in order to turn assumptions and relational effects back on themselves as a means to different ends.

Chapter 4: Situating UK Fire Service Provision

‘At the moment we do not have the right resources in the right places at the right time’.

George Bain et al., (2002) ‘Independent Review of the Fire Service’.

‘Most metropolitan brigades felt that their vehicle dispositions were appropriate to cope with the attendance times and resource requirements for dwellings.... [However] this general trend becomes greatly exacerbated when the effect of “other buildings” is included. Metropolitan brigades needed a 50 per cent increase in appliances in each station to achieve the initial attendance. Mixed and rural brigades needed to increase numbers of appliances and convert retained crews to whole time crews if they were to achieve the attendance requirements.... In the case of dwellings, the majority of attendance requirements for dwelling risks could be met with some redeployment of resources in metropolitan and city areas, but this reduced as areas became more rural.... To achieve the [national] attendance requirements, some brigades estimate that they would need to increase in size by a factor of 100 per cent’.

Fire Brigades Union (2002) ‘Pathfinder Brigade Feedback’.

4.1 Introduction

The purpose of this chapter is to situate the analysis of the introduction and use of the Vehicle Mounted Data System (VMDS) at Hereford and Worcester Fire Brigade that is set out in Chapters 6 to 8. This chapter provides a detailed exposition of the provision of fire services across the UK taking the end of the 1970s as the primary starting point. This provides an appropriate place to begin contextualising the fire service because, firstly, it marks out the time period when an enduring national agreement on pay and conditions was enacted after a national strike in 1977-78, and, secondly, it prefaces the challenges to public sector service provision that would become one of the cornerstones of the post-1979 Conservative government.

One of the pervasive features of fire service provision over the last 25 years has been the interplay between the stability of national and local brigade-level agreements on working practices, terms and conditions, and controversy-inducing challenges to these agreements. This chapter charts the emergence of these challenges throughout the 1980s and 1990s and the way in which the tensions they have constituted have been temporarily deferred. In understanding this precarious deferral this chapter argues that in order to conceptualise continuities and changes it is important to analyse the way in which tensions have been distributed through a range of resilient institutionalised practices, enduring officer and union assumptions of a public sector ethos, and sustained sympathy for the fire service in local authority politics.

In order to chronicle changes and continuities this chapter is structured around a longitudinal exposition of UK fire service provision. The chapter combines evidence from primary research material, government reports, fire service policy and advisory documents, and other scholarly research. The argument of this chapter is that from the early 1980s

onwards the fire service has been under pressure to make efficiency savings and reduce operational costs. Pressures have taken varying forms and have been mediated by actors in and beyond the fire service in a number of ways so that precise effects are often specific to brigades.

It can be argued with important empirical provisos and the analytical dangers of separating the mutual constitution of context and content that the vicissitudes of the fire service over the last 25 years have paralleled the tensions and contradictions faced by other parts of the public sector. The fire service instantiates the political economy and techno-administrative assumptions of the last 25 years and, before that, the 'golden age' of model public sector employment from the end of the Second World War (see Rhodes, 1985). There are however significant differences between the fire service and other public sector service providers (such as the NHS, the police service and the civil service). This has meant that the timing, nature and process of fire service changes have taken particular forms with certain aspects of modernisation taken for granted in other parts of the public sector being absent from the fire service. It is, for instance, only from the late 1990s that modernisation of fire service provision has attracted public attention.

This chapter is structured in the following way. The next section (Section 4.2) provides a few introductory remarks about the history of the fire service. This is followed by a broad introduction to the new managerialist or 'new right' challenge to public service provision which began in the early 1980s (Section 4.3).¹⁵ The intention here is to set the scene for an account of the particularities of the institutional context of fire service and the internal politics of fire service modernisation that is set out in the rest of the chapter. This means drawing an externalist and internalist account but attempting not to reduce actors to single or immutable interests and preoccupations, and remaining wary of reducing the context of

¹⁵ Some secondary empirical material in this chapter is from after the primary research was undertaken.

fire service provision to a taken for granted external reality. Following this section, Sections 4.4 and 4.5 set out important facts and figures, key stakeholders and Hereford and Worcester Fire Brigade. Section 4.6 sets out the challenges to national standards of fire cover and Section 4.7 examines the demands for expenditure cuts throughout the 1980s and how demands intensified in the early to mid-1990s. This section is followed by an exposition in Section 4.8 of the increasing demands for value for money with the publication of an Audit Commission's report 'In the Line of Fire' in 1995. This provides the context for Section 4.9, which examines the recent preoccupation with modernisation after the publication of the Independent Review of the Fire Service in 2002. Section 4.10 provides an introduction to the importance of local practices and the role of representative actors. Section 4.11 focuses on the fire service's debate on mobile information and communications and provides a preface to Chapters 6-8, which focus upon the implementation and use of the VMDS at Hereford and Worcester Fire Brigade.

4.2 A Brief History of Fire Service Provision

Blackstone (1957) states that there would have been some organised firefighting in the cities of antiquity and that Rome probably had the first professional firemen called Vigiles, who also functioned as policemen (Hereford and Worcester Fire Brigade, 1985: 1). It was the Great Fire of London in September 1666, in which 'squirts' similar to those in Roman times were used, that provided the impetus for the introduction of the first fire insurance brigades in 1684 (Blackstone, 1957). These were commercial fire services charged with fighting fires in properties insured by the fire insurance company, identified by a 'fire mark' attached to the outside of the building. It was however the mid- to late-nineteenth century, with the emergence of new forms of industrial activity, the expansion of cities, and anxieties provoked by the large-scale movement of the population from the country to urban environments that Blackstone argues provided the conditions for the constitution of

approaches to fire service provision that bear some resemblance with contemporary assumptions. In 1833, for instance, the London Fire Engine Establishment was formed and this became the London Fire Brigade when it came under the control of London County Council in 1904, with fire service provision remaining the remit of local authorities throughout the twentieth century apart from a short period during the Second World War (Baigent, 2001; Ewen, 2003).

Until the outbreak of the Second World War local authorities were responsible, although not compelled, for the provision of fire services (Blackstone, 1957). Together with the transformation of society from the mid-1850s onwards it was the pressing concerns and legacies of the Second World War that provide the second link with the contemporary organisation of fire services. The National Fire Service was formed in May 1941 by an Act of Parliament to provide fire protection to a country at war, with some 1,400 local brigades transferred to central government control. Blackstone (1957) writes that within a few months a uniform approach to fire services, in a period of national mobilisation, became imperative and included, for example, drives toward the compatibility of formerly non-standardised equipment (e.g., differing sizes for hose couplings) and of firefighting practice in order to carry out national-level instructions.

Baigent (2001) describes how immediately after the war an important piece of legislation, the Fire Services Act 1947, established the first British standard code of practice on 'Precautions against fire'. In addition, the fire brigades union gained authority with regard to technical matters of fire service provision (Segars, 1989 in Baigent, 2001:4). Many of the obligations, assumptions and practices of the Fire Services Act remain central to the current fire service, particularly in terms of the day-to-day operational management (e.g., concepts such as risk categories and attendance times) and the national-level negotiations that take place between fire authorities, senior fire service management and the fire brigades' union.

In April 1948 the national fire service was returned to local county council and county borough control. Instead of the nearly 1,700 separate local bodies there were only 141 county and county borough fire authorities with locally elected politicians responsible for the allocation of centrally funded fire services (see Baigent, 2001). In April 1974 a major reorganisation of county boundaries took place and this rationalised again the number of county and metropolitan fire brigades to 62.

4.3 The New Public Sector Management and Fire Services

Since the early 1980s the public sector in the UK has been subject to pressures from central government to restructure the provision of services toward market forms of coordination (see, for example, Clarke and Newman, 1997; Ferlie et al., 1996; Foster and Plowden, 1996; Pollitt, 1993; Pollitt et al., 1998). This has occurred in different ways in different sectors although demands for efficiency savings, the establishment of regimes for performance measurement and inspection (Power, 1997), and tightened financial resourcing, can be generalised across the public sector. In addition a fundamental part of the attempt to transform public service provision has been the attempt to constitute a context in which 'managers have a right to manage' (Kirkpatrick and Martinez Lucio, 1995) and the concomitant assumption that trade unions' narrow self-interest in defending their members' working practices distorts the efficient structuring of organised activity. This shift from multi-actor negotiated order occurred concurrently, and was enacted in practice, by a combination of changes at the legislative, institutional and cultural level (see du Gay and Salaman, 1992; Legge, 1995) aimed at undermining the basis of the power of representative actors but also more generally at destabilising the corporatist/tripartite approach to public sector administration and 'model employer' terms and conditions that had been gradually and precariously institutionalised post-World War II. The Labour government, elected in 1997, show few signs of relinquishing the agenda of change even if

the rhetoric has been translated into modernisation and private finance initiatives (PFI) rather than a de-regulated/marketised system (or full-scale transfer from state to private ownership in the case of state enterprises). The current government's concern with delivering more efficient services through comparative performance indicators (PI) and, since 2000, Best Value Reviews (BVR) provides, then, continuity with the interventionist and coercive practices characteristic of the previous Conservative government.

Notwithstanding the generalisations of public sector change noted above, the unevenness of policy initiatives, in terms of, for example, the content, timing and alignment of interests of top-down change programmes, must also be accounted for. The fire service was not, for example, a central focus of public sector reform for the Conservative government of 1979-1997 not least because the fire service was associated with quality public performance and public respect, trade union influence was institutionalised and modernisation of the fire service required significant financial investment. Nonetheless as with other parts of the public sector (e.g., healthcare, social services and the civil service) pressures to restructure and improve efficiency of fire services have been top-down and originated, in large part, in reviews and reports from external/government agencies. These top-down recommendations for change (e.g., Audit Commission, 1995; Bain et al., 2002) have often been associated with marginalising the contribution to an agenda for change of internal fire service actors at all organisational levels. Significantly in terms of change and reform, the interests of the chief fire officers' association, which is made up of former firefighters and considers itself the custodian of the fire service's professional values and has significant impact upon day-to-day operational practices, has not been unequivocally aligned with government initiatives. This has meant that centrally-driven policy recommendations have often reduced commitment to reorganisation because of their association with unwarranted and politicised intervention to the fire service's custodial/professional ethos (see also Ackroyd et al.,

1989). The function of information and communication technologies in reforming fire service provision was, significantly, minimal until the late 1990s although there has been considerable debate about the replacement of the radio communications network throughout the 1990s. Before the late 1990s the role of information and communication technologies in national reviews was, however, circumscribed to updating and rationalising command and control centres. ICT-mediated front-line incident management was absent from the agenda of efficiency, effectiveness and modernisation.

It is also important to note that major fire service policy initiatives have occurred later than in other parts of the public sector even though representatives of senior officers and firefighters have called for improvements to the provision of fire services throughout the 1990s (FBU, 1960 in Baigent, 2001: 10). In terms of timing, central demands to restructure, which are likely to add significantly to expenditure at least in the short- to medium-term, occurred in the early to mid-1990s in conjunction with demands to reduce financial inputs and reorganise around a less flexible funding structure. In this context central government attempts to reorganise fire services became associated with dubious long-term intentions of reducing the quality of service provision and negative short-term consequences of cost reduction rather than a more positive reappraisal of how to organise high quality fire service provision in a changing society. In addition, from the late 1990s two further political contexts have been important for debates about fire service provision. First, as part of its election manifesto the first term of the Labour government was constrained by the previous Conservative administration's spending plans. Second, and as mentioned above, until the recent national firefighter strike the fire service had, in terms of the public understanding of changes to public services, been relatively invisible in comparison to, for example, the national health service and the provision of educational services.

4.4 Fire Service Work and Management Structure

Fire services respond to emergency fire calls and have a statutory duty under the Fire Services Act (1947) to attend fire-related incidents. The UK Fire Service is publicly funded with the aim of protecting the public from fire. The UK fire service is divided into three regions: England and Wales, Scotland and Northern Ireland (referred to as UK fire services). Brigades are directly accountable to their local fire authorities, which receive funding, policy guidance and instructions from central government.

The number of incidents attended by brigades during the years 1995 to 1998 is set out in the Table 1 in Appendix 2.¹⁶ As the table shows brigades attend a range of incidents and the number of incidents has been reducing from the mid-1990s onwards. The total number of fatalities from fire has also been reducing since the late 1980s. For example, in 1995 there were 627 fire deaths, with 538 in 1998, with the number of rescues by firefighters from 1995 to 1998 between 3,600 and 3,700 (HM Inspectorate, Chief Inspector, 1999-2000).

Although the majority of firefighters' emergency activity is related to fires, this accounts in fact for a small percentage of firefighters' working time. Over thirty years ago the Cunningham Report (1971) (see Bain et al., 2002) estimated fighting fires to be between 3 and 10 per cent of firefighters' working time; more recently the Audit Commission (1995) suggested it accounted for between 5 and 10 per cent of firefighters' working time.¹⁷ In 1999 the total number of full-time/wholetime personnel in fire brigades in England and Wales was 35,417 (including non-operational personnel). The number of retained/part-time firefighters in 1999 was 14,963 (HM Inspector Chief Inspector, 1999/2000). Although

¹⁶ The figures in this section relate to England and Wales unless stated otherwise.

¹⁷ The majority of fires occur at evening meal times (between 6 and 8pm) with the lowest number of fire incidents at around 6am (Fire Statistics, ODPM quoted in Bain et al., 2002: 20). Deaths from fires in buildings does not vary as significantly during the day with the highest incidence of death between midnight and 2am with high peaks until 6am. Although there are fewer incidents in the early hours these are the incidents with the highest levels of fatality (Bain et al., 2002).

retained firefighters comprise of less than half of their full-time equivalents around 60 per cent of fire appliances are crewed by retained firefighters (Bain et al., 2002: 105). During the 1990s there were 13 firefighter fatalities with six in total in the years 1993 and 1996. Non-fatal casualties during the same period ranged from around 1,300 in 1990 to around 600 in 2000. Over 75 per cent of total expenditure on the fire service in England and Wales is related to human resources. Fire Service expenditure is detailed in Table 2 in Appendix 2.

The management of the fire service is comprised of central government departments, government inspectorates, national policy forums, the national joint council, the national Fire Service College, fire authorities and fire brigades. Recruitment to senior fire officer positions has, historically, come from firefighters working their way up the ranks—the internal single tier entry promotion (STEP) (for more detail see Baigent, 2001: 6)—and this has constituted a significant internal professional closure on fire service management. The management structure together with other important actors is detailed in Table 3 in Appendix 2.

4.5 Introduction to Hereford and Worcester Fire Brigade

Hereford and Worcester Fire Brigade is one of 50 fire brigades in England and Wales and is responsible for a geographical area of over 390,000 hectares and a population of over 700,000. Hereford and Worcester Fire Brigade is, at the time of writing, comprised of three districts (North, South and West) and 27 stations (26 in 1997) of which five are wholetime, three are day-crewed and 19 retained. There are a total of 61 operational vehicles (also known as fire appliances). Hereford and Worcester Fire Brigade is comprised of over 700 wholetime (332 full-time) and retained (369 part-time) firefighters, 21 command and control staff and 98 non-uniformed support staff. The brigade follows the national practice

of separating wholetime and retained crews with crews following the national shift pattern of two day shifts of nine hours, two night shifts of 15 hours and then a number of days' leave. Shifts for watches, which are organised around constant crewing, comprise of operational incidents, training, community fire safety, equipment maintenance and gathering information on commercial premises and special risks (e.g., schools and hospitals) for the Central Risk Register (CRR) on the Vehicle Mounted Data System. Firefighters at day-crewed stations work four day shifts of nine hours and provide operational cover from home in the evening, for which they receive extra payments when they respond to incidents. Each station has a designated 'turn out' boundary/area. This sets out the geographical boundary of station and watch responsibility. Turn out boundaries are determined by a combination of calculations from national fire cover categories and local legacies. Fire crews are mobilised by Hereford and Worcester Fire Brigade's command and control centre using standardised procedures based on turn out boundaries and national risk classification. In the normal course of activity fire crews move outside of turn out boundaries for major incidents or concurrent incidents that require the deployment of extra resources.

In 1974 the fire brigades of Herefordshire and Worcestershire were rationalised and restructured to the Fire Authority for Hereford and Worcester. This structure remained in place for over twenty years until April 1998 when, as part of the reorganisation of local government initiated by a Local Government Commission, Hereford and Worcester County Council was split into two counties: a unitary authority for Hereford, responsible for the functions of a county and district council, and a two-tier structure for Worcestershire with a County Council with six District Councils. The existing fire service provision, based upon Hereford and Worcester County Council, was replaced with a Combined Fire Authority covering both counties. Hereford and Worcester Combined Fire Authority, which consists

of twenty-five elected councillors (19 representing Worcestershire and six representing Herefordshire), is responsible for providing fire services to the two counties and is jointly funded by the two county councils.

The budget for Hereford and Worcester Fire Brigade is over £20 million per year. In 2004/5 Combined Fire has one of highest ratios of funding by Council Tax (60 per cent) vis-à-vis central government SSA grant (40 per cent) of any UK fire service (Hereford and Worcester Fire Brigade, Performance Plan Summary, 2004/5). Hereford and Worcester Fire Brigade is also considered an economic fire service provider compared to many other UK fire brigades. Hereford and Worcester Fire Brigade's recent Best Value Performance Plan states that the brigade is one of the lowest spending in England and Wales (£37.10 per head of population in 2004/5 compared to £54.58 in Cleveland, Hereford and Worcester Fire Brigade, Performance Plan Summary, 2004/5). This compares favourably with both the national and 'family group'¹⁸ averages (Hereford and Worcester Fire Brigade 2003, Appendix H). Hereford and Worcester Fire Brigade attended 9,679 incidents during 1996-1997, 10,554 during 1995-1996 and 8,941 during 1994-1995 (Hereford and Worcester Fire Brigade, 1998: 11). The brigade met national attendance times in 94.7 per cent of incidents during 1996-1997, 92 per cent during 1995-1996 and 91.3 per cent during 1994-1995.

4.6 Challenges to National Standards of Fire Cover

There are six categories of fire cover (A, B, C, D, Remote Rural and Special Risk) and these are determined by the type and density of buildings and properties (see also Audit

¹⁸ Hereford and Worcester Fire Brigade's performance is compared with similar, 'family group', fire authorities (in terms of geographic size, risk diversity, population and regional infrastructure). The brigades within Hereford and Worcester Fire Brigade's family group include Lincolnshire, North Yorkshire and Devon fire service.

Commission, 1995; Bain et al., 2002).¹⁹ Standards of fire cover were first developed in 1936 by the Riverdale Committee although it was not until 1944 that standards of fire cover were formulated that covered the entire country, with amendments to these standards in 1958 (see Blackstone, 1957; Davis, 1996; Maxwell, 1997). Current national response standards, times and crew levels for fire incidents (but not for other emergencies), which are not subject to local discretion except by approval of the Secretary of State under Section 19 of the Fire Services Act 1947, are related to these different categories of cover, with higher density buildings/properties denoting the deployment of a greater number of fire appliances and crews, and shorter attendance time targets. The current premise for calculating the vast majority of day-to-day fire brigade funding is the level of risk that constitutes the categories of fire cover (Table 4, Appendix 2). This in turn determines the number of fire appliances that must attend an incident (Table 5, Appendix 2).

National response times are the single most important performance measure for the fire service. Tables 4 and 5 in Appendix 2 illustrate how, for example, risk category B means that two appliances must be deployed and that the first appliance must reach the incident within five minutes and the second within eight minutes. Unlike other parts of the public sector the fire service is considered to meet public expectations of service provision. For example, in a fire service debate in parliament on 8 May 1996 Jack Straw MP began with a statement on the performance of the fire service:

As the Audit Commission reported, in 1994-5 an astonishing 95 per cent of fire calls were met within the specified standard. That response rate was a one per cent improvement on the previous year, at 94 per cent. No other public service, in local government or outside, can match such consistently high standards of performance or provide such value for money (Straw in Hansard, 1996: column 296).

In the mid-1980s the Home Office published a report that instructed fire authorities to reassess their fire risk categories. Table 6 in Appendix 2 details the percentages associated

¹⁹ National standards of fire cover were last reviewed across the UK in 1985. Hereford and Worcester Fire Brigade reviewed its own allocation of national standards (i.e., station 1 as A risk, station 2 as B risk, etc.) in 1995.

with each fire risk category and changes over a ten-year period from 1983 to 1993 split into two five-year periods.

The table illustrates that Remote Rural was first used in 1988 with significant percentage reductions in categories B, C and D from 1983-1988 and further reductions in categories A, B and C from 1983-1993. In order to make sense of these changes in the context of a rise in the number of fires between 1953-1993, increases in false alarms and special service incidents (Audit Commission, 1995: 8), Stirling and Fitzgerald (1997) argue that it is important to situate changing percentages of risk cover within the wider political context of public sector expenditure cuts particularly during the years 1979-1984 and, importantly for current fire services, during the mid- to late-1990s.²⁰

The drive to reduce public sector expenditure and increase cost-effectiveness dates back to the early 1980s as these quotes from the then Home Secretary demonstrate: '[I]t is my policy to encourage Fire Authorities to make expenditure savings where this can be done without endangering the safety of the public' (Home Secretary in 1980 in Labour Research, 1990: 15, quoted in Stirling and Fitzgerald, 1997: 6). Some four years later the same point was reiterated:

The government ... looks to each Fire Authority not only to assess the appropriate level of protection within the area for life and property, but also to ensure that the protection is provided as economically and as efficiently as possible (Home Secretary's 1984 speech to the Chief and Assistant Chief Fire Officers' Association, in HM Fire Inspectorate, 1995: 14, quoted in Stirling and Fitzgerald, 1997: 10).

The concern for cost reduction is also translated into attempts to change the ethos of service provision from one that exceeds national standards to one that meets national standards.

The Audit Commission's (1995) report set out how fire brigades must meet the time limits for attending an incident in all call-outs (i.e., 100 per cent of the time), but the number of

²⁰ 'In real terms, the amount of spending earmarked by central Government rose between 1984 and 1993-94. Since then, that spending slowly declined in real terms. In England, it declined from £1,233 million in 1994-95 to £1,200 million last year, and £1,185 this year' (Straw in Hansard, 1996: column 299).

firefighters crewing each fire appliance that attends an incident must reach the required national standard in only three out of four call-outs (i.e., 75 per cent of the time). The Commission's report (1995: 8) states that fire brigades exceed the national targets for confidence or ridership level by over 15 per cent and that this should be something that brigades examine in order to bring out efficiency savings from what is 'over-provision':

I am aware there are a number of instances where fire authorities have been reluctant to take steps to eliminate over-provision of fire cover. I would urge you as Chief Fire Officers to address these issues objectively, knowing you will have the full support of Her Majesty's Inspectors in seeking to eliminate over-provision of cover (Home Secretary addressing Chief Fire Officers in 1989 from Labour Research 1990: 17, quoted in Stirling and Fitzgerald, 1997: 49).

This shift from exceeding national standards to attaining the national standards was controversial and contested not only by the fire brigades' union wishing to defend 'out of date practices' but the fire service's executive management and institutional representation, which considered such demands an unwarranted external intervention into the professional management of the fire service that might have a different concept of quality from one based upon a 'flexible and modern approach' to exceeding the national minimum.²¹ The former president of the Chief and Assistant Chief Fire Officers' Association, Dennis Davis, explicitly contested this push toward making the national minimum the standard around which services are provided at his presidential address to the National Fire Conference in 1995:

The accountants have the.... ability, if allowed to operate in isolation, to replace managerial freedom and sensible professional decisions with nonsensical arguments devoid of any human face. Minimal standards of fire cover are quickly becoming the maximum.... This is fast becoming a reality with people trying to measure quality (Davis, 1995: 5, quoted in Stirling and Fitzgerald, 1997: 22).

Davis (1995) emphasised the already professional management and highly-regarded quality service provided by brigades: put another way, the fire service's professional custodians already make efficiency savings where they are appropriate without central government

²¹ 'Despite increasing and unwelcome central control from Whitehall' (Straw in Hansard, 1996: column 297).

intervention, and exceeding the national minimum for response times and crew levels is an enactment of 'high quality service' as much as 'over-provision'. The controversy about over-provision continued some months later with a parliamentary fire service debate to which Dennis Davis had sent a letter expressing his concern about the funding of the fire service and calling for a 'proper national debate' on the fire service (see Davis, 1996: 38-39). During the debate David Clelland MP raised the issue of minimum standards in the context of the £1.8 million budgetary cut to Tyne and Wear fire authority in 1995:

When I protested to the Secretary of State for the Environment about the settlement that is causing the cuts, I was told that the Government Standard Spending Assessment—a Mickey Mouse figure that Ministers use to make things appear to be what they are not and which does not take account of special services and the specialist machinery necessary to deal with road traffic accidents, people trapped in lifts and machinery and, as has been mentioned, payments to the pension fund—*allowed the authority to operate within the minimum standards* (Clelland in Hansard, 1996: column, 315, emphasis added).

4.7 Funding the Fire Service: Financial Retrenchment

The fire service is funded in a variety of ways but the most important source of resources is central government revenue grants that fire brigades receive via local fire authorities as part of the Standard Spending Assessment (SSA) (see also Stevenson, 1982). Other sources include payments from the Home Office for attending incidents, national non-domestic rates, the council tax and credit approvals for capital expenditure from, for example, local authority or fire brigade reserves. Fire services are funded according to the national risk categories described above and the number of incidents attended (Audit Commission, 1995: 14-15). At the time the research was conducted community fire prevention activity did not attract explicit central funding (see also Bain et al., 2002: 41). The fire service is a local authority service and this means that local authorities, particularly in non-metropolitan councils, decide on the local priorities and have discretion to change the level of fire service

funding from the central SSA calculation. During a parliamentary fire service debate,

Michael Howard MP stated that:

Statutory responsibility for providing an effective and efficient service to meet all normal requirements rests with the local authority. The fire service is funded, like all local authority services, through the revenue support grant, national non-domestic rates and the council tax. Local authorities have the opportunity to discuss the question of resources at the Consultative Council on Local Government Finance, which is chaired by my right Hon. Friend the Secretary of State for the Environment (Howard in Hansard, 1996: column 308).

Most brigades' expenditure is in excess of the SSA with some rural brigades spending over 40 per cent more (Audit Commission, 1995: 40).²² Fitzgerald and Stirling (1999) argue that it is the changes in the way the fire service is funded that are critical for understanding the challenge to the negotiated order between fire authorities, the fire brigades, the fire brigades' union and central and local government. Like most labour intensive organisations human resource costs comprise the vast majority of brigades' expenditure (see Table 2, Appendix 2). The then Home Office Minister spoke at the 1994 National Fire conference and set out the position on funding in the first half of the 1990s:

The government has a clear policy on public expenditure. We believe that expenditure controls are essential to promote national economic recovery and employment. The fire service, like other public services, cannot stand apart from these controls. Nor do the facts seem to me to support any suggestion that the fire service is under-funded ... (whilst recent) settlements were not as great as those achieved in earlier years, they were all that could be afforded in the current climate (quoted in Fitzgerald and Stirling, 1999: 47).

Fitzgerald and Stirling (1999: 48) continue that although funding for the fire service has increased since the Labour government was elected in 1997, under the previous Conservative government it declined in real terms throughout the 1990s with a funding gap of £10 million in 1992/93 that increased to £125 million in 1997/98 (Local Authority

²² Local authorities have often been willing to provide local fire brigade with extra financial resources as Jack Straw MP set out in the debate: 'One key indicator of the pressure on fire services is the fact that nearly 75 per cent of fire brigades are funded above the standard spending assessment levels. That is done by forcing county councils to save cash in other areas such as education and social services, or through the use of reserves just to maintain an adequate level of cover. But the flexibility that that at least gives county brigades is not available to joint fire authorities in metropolitan areas, or to the new combined fire authorities in areas with unitary local authorities' (Straw in Hansard, 1996: column 300).

Association, 1996: 2.6 and Local Government Association, 1998: 1.8). Real-term cuts in funding from the early 1990s have also been accompanied by a strong emphasis upon reviewing the SSA, Private Finance Initiatives (PFI) for capital investment, the transfer of shire counties to combined authorities with less local financial flexibility and, since the late 1990s, in attempts to initiate the restructuring of service provision through central government mandates to conduct Best Value Reviews.

Significant parts of the 1996 parliamentary fire service debate centred upon the responsibility for under-funding the fire service, with Conservative MPs blaming Labour controlled local authorities, and Labour MPs pointing the finger of responsibility to the structure of the central government SSA. Derek Skinner MP, for example, provided a critical perspective on fire service funding in comparison to Michael Howard's 1994 speech above:

It is appropriate to say that over the past few years massive cuts have been engineered and imposed on fire authorities by the Home Secretary and his mate, the Secretary of State for the Environment. Between them, they have introduced cuts in many counties ... where part time stations are being closed (Skinner in Hansard, 1996: column 298).

It has already been mentioned that shire authorities have very often agreed, as part of a local political consensus, to provide extra levels of funding to the local fire brigade, that is, to fund fire brigades above the Standard Spending Assessment (SSA) level. This has meant that although fire service expenditure exceeds formal allocations by 'something of the order of £80 million' this funding issue has not gained widespread central government visibility. The successful mobilisation of local public opinion has, in other words, mediated central expenditure cuts that have occurred in other parts of the public sector. In addition to the public support and sympathy for firefighters there have also been supportive Labour controlled local authorities and union activity that has helped maintain the firefighters' presence in local authorities' funding decisions and across the wider local community. This

has meant, according to Davis (1996: 38), that 'this issue has not, however, reached the status of a national debate because in many cases local government has consistently placed Fire Services higher in the list of local service priorities, often to the detriment of other services'.

There are, however, constraints to topping-up local fire service provision, both in terms of the level of extra resources available above the SSA and particularly so given the changing financial structure that combined authorities (e.g., Hereford and Worcester Fire Brigade from April 1998) have to work within. Combined fire authorities are, for example, placed under a stricter and more inflexible financial regime and have to 'stand alone' as Fitzgerald and Stirling (1999: 48) set out:

In shire brigades the SSA [Standard Spending Assessment] is paid as part of an annual block grant which includes all local authority services thus allowing authorities to increase funding at their discretion. For some brigades this situation has changed recently with the introduction of combined fire authorities which have a far tighter financial regime.

Fitzgerald and Stirling (1999: 48) set out the various options fire brigades have in attempting to make up the short-fall in their annual income: local authorities have often made representations to central government to renegotiate the cap on the SSA, sometimes with success; fire brigades can, controversially, borrow from brigade reserves (taking from reserves marked for pension contributions, for example); 'generate' extra income through internal efficiency savings, or fund capital expenditure through PFI schemes. It is this emphasis upon efficiency saving and PFIs that has become the focus not least because the other options are not considered sustainable long-term solutions.

Given that the vast majority of brigade expenditure is related to human resources, it is workplace practices and local terms and conditions that have become the focus of potential savings. Brigades have, then, been placed under significant financial pressure by real-term reductions in their annual income in the early to mid-1990s, based upon existing risk cover

categories, together with an increasing number of new activities such as special service incidents and community fire prevention. The general analytical point that can be made is that, as Fitzgerald and Stirling (1999) set out, tighter financial flexibility has created a funding gap that has built up over a number of years which, together with the expanding remit for firefighters, has placed significant strain upon the negotiated order and institutionalised ethos of multi-lateral public administration.

4.8 Efficiency Savings: Getting Value for Money from the Fire Service

The preoccupation with efficiency savings and best value for money intensified with the Audit Commission's report 'In the Line of Fire', a study which began in October 1993 and was published in February 1995 along with a separate Management Handbook. The report, which was the first national report since the previous Audit Commission's report in 1985, concluded that although the fire service was generally well managed 'there are local opportunities that can be taken now.... The locally achievable savings identified by this study are £67 million a year. This represents 5 per cent of the total expenditure on the fire service' (Audit Commission, 1995: 58-60, quoted in Howard in Hansard, 1996: column 307).

Potential savings were identified in four areas. First, £17 million through a reduction in the level of sickness and absenteeism so that stations do not require so many 'buffer' firefighters to be able to maintain national crewing levels. Second, a small saving of £8 million related to leave arrangements. Third, £13 million through the creation of inter-brigade command and control rooms, particularly for smaller brigades. Fourth, the largest saving of £29 million through a 'slimming down of management structures' (Audit Commission, 1995: 60; see also Stirling and Fitzgerald, 1997). The focus on efficiency savings in the Commission's report is also directly concerned with modernising

firefighters' conditions of employment. This includes the requirement for more watch flexibility, in particular in terms of crew levels, which is consistent with other attempts to reduce 'overprovision'.

The Scheme of Conditions of Service (section II, part 1, para 2) states that 'the shift rota shall be designed so as to provide as nearly as possible that the number of firefighters normally available for duty from time to time is constant' (quoted in Audit Commission, 1995: 37). The report continues that this condition of service 'would not permit firefighters being moved between stations in response to variations in risk during the day and night' and that 'if the fire service is going to develop', a comprehensive review of the conditions of service should be made by the NJC (Audit Commission, 1995: 37). At the CACFOA 1995 conference, Baroness Blatch (1995: 8) repeated the recommendations from the Audit Commission's report. She stated that 'there were opportunities for individual brigades to improve their efficiency and make some savings although it is acknowledged that, in some cases, any savings achieved could only be of the 'slow release' variety' (quoted in Stirling and Fitzgerald, 1997: 10).

Yet critically in addition to 'slow release' (that is, over 3-5 years) savings the Audit Commission's annual Local Government Audits Report for 1994-95 stated that 'the level of realistic improvement opportunities is significantly less than the theoretical figure [that is, £67 million] identified in the national report'. The Local Government Report continued that 'most of these reductions are of a short-term nature and cannot be sustained if the current level of service is to be maintained' (Local Authority Association, 1996: 2.29-30, quoted in Stirling and Fitzgerald 1997: 11). The Local Government Association calculated that potential savings of between £6-7 million were more realistic (Local Government Association, 1998: 2.4.4, quoted in Fitzgerald and Stirling, 1999: 49). In addition to this, and as the Audit Commission's report concluded, the fire service is already out-performing

other parts of the public sector and it is therefore unlikely that brigades will be able to achieve year-on-year performance improvements. The Chair of North Brigade Fire (a pseudonym) and a Public Protection Committee stated that in relation to the 1997 SSA budget the organisational limits to efficiency savings and continued funding gaps have placed brigades in a position of cutting the level of service provision: 'we're looking at reducing the manning levels on the emergency tenders, that's 36 posts out' (Stirling and Fitzgerald, 1997: 13). Other reductions, at that time, included stopping new recruitment, reducing the internal and Fire Service College training budget, cutting personal allowances and the possibility of compulsory redundancies.

The controversy over 'efficiency saving' demonstrates a number of important points that help to situate actual and attempted changes to fire service provision during the 1980s and 1990s. The first is that for 25 years there has been a general preoccupation with reducing the expenditure on the fire service through the introduction of particular financial regimes that: i) attempted to limit brigades' expenditure beyond the SSA grant, ii) shifted the source of extra financial resources to the private sector or brigade reserves, and, iii) identified internal restructuring as the focus for efficiency savings. The second is that the form and process of efficiency is an essentially contested concept between and within fire service actors (i.e., between and within fire brigades, the Audit Commission, HM Fire Service Inspectorates, the fire brigades' union, the association for senior officers, local fire authorities, and central government). The third is that financial pressures have challenged the stability of institutionalised practices and placed demands on fire brigades to restructure the local provision of services. The fourth is that although it often purported in popular commentary (e.g., Bain et al., 2002) that the fire service has remained outside of many of the changes that have affected other public services (for a review see Legge, 1995) there

has been significant adoption of administrative practices associated with managerialism such as comparative performance measures.

Fifth, modernisation through the implementation of ICTs is accorded very little attention in the Audit Commission's report despite the role of IT in changing other parts of the public sector. Information technology is discussed in three paragraphs which suggest that there is potential for economies of scale from amalgamating control rooms between fire brigades and other emergency services. The development of new systems is also noted, albeit in passing, with GIS and 'control consoles' mentioned. In the accompanying Management Report, IT is mentioned in terms of speeding up 'back-office' activities including risk assessment updates but there is little mention of front-line operational information and communication technology. The report does not, in other words, contain a strategic vision or detailed proposals for IT and neither does it mention the national debate on fire service provision that the CACFOA had been calling for in the 1990s. The Audit Commission's reports can, then, be understood as providing evidence to conclude that national policy initiatives comprise of changing existing working practices but the role of information and communication technologies in the vision of a modernised and more efficient fire service was considered, at that point in time, insignificant.

4.9 Modernisation and the Independent Review of the Fire Service

In 2002 an Independent Review of the Fire Service (Bain et al., 2002), chaired by Professor George Bain, was published after a three-month study into current fire service provision. This review, which was seven years after the last major national review in 1995, gained widespread media attention not least because the timing of the research and publication overlapped with a national industrial fire service strike. Most generally the Bain review strongly recommended 'top to bottom' change throughout the fire service including a shift

from incident management to fire prevention, devolved terms and conditions and working practices, and an approach to the allocation of resources centred upon changing levels of risk throughout the day (Bain et al., 2002: ii; cf., FBU, 2002). As a part of this Bain et al., (2002: iv) states 'there are cogent arguments in favour of moving the Fire Service into a regional structure. New responsibilities are emerging, such as the need to deal with major terrorist incidents'.

This vision of the future of the fire service as one of substantial change is predicated, in large part, on two inter-related rhetorical premises deployed throughout the review: firstly, that the fire service has not changed significantly over the last two decades, and, secondly, that narrow interest groups, including the institutionalised NJC, have incorporated current practices into their own agenda. Given these two premises, the fire service is ripe for top-down managerial restructuring. The review begins by stating that other reviews and reports 'have resulted in little change', and presents a more strident account of the need for a new cadre of managers than, for example, the Audit Commission's 1995 national report. On this basis, the review panel attempts to add to the legitimacy of the conclusion that they 'were surprised at the extent to which the Fire Service has fallen behind best practice in the public and private sector.... Staying where we are is not an option, and we believe that reform will bring greater gains for everyone' (Bain et al., 2002: i-ii).

The Bain review recommends a set of wide-ranging series of changes to the fire service. These include a clear policy framework from central government, statutory funding of community²³ fire safety activity and the formation of new institutional actors; a shift to a risk-based approach to the deployment of resources (see Davis, 1997; see also Chapter 8);

²³ 'Until the local government finance settlement announced on 5 December this year [2002], only a miniscule element of the Standard Spending Assessment (SSA) formula was linked to fire safety in any form. So there is no encouragement to invest in fire safety; quite the reverse, since fire authorities got no extra money for reducing fires' (Bain et al., 2002: 38). Similarly road traffic accidents do not accrue significant funding.

stronger local management and the introduction of devolved decisions for working practices;²⁴ increased cooperation between brigades, particularly within regions; and, greater inter-emergency service collaboration. It is worth mentioning two recommendations that are relevant for the following chapters: a shift to local risk management and localised working practices.

The review's first recommendation is that it is critical for each fire brigade to alter the level of fire cover (i.e., number of fire appliances) and weight of cover (i.e., confidence level) over the course of a 24-hour period: shifting fire service provision to a risk-based approach that changes over the working day. Bain et al. (2002: 17) states that there are at least two significant problems with this current categorisation of fire cover based upon six categories (see Appendix 2, Tables 4 and 5). First, after normal working hours fire crews are often located so that they protect unoccupied buildings (e.g., commercial areas), that is to say, the deployment of fire stations and appliances does not match 'the risks run by the people who live locally' (Bain et al., 2002: 29). Secondly, automatic fire alarms in town centres are almost without exception false alarms (98 per cent of cases). This constitutes a wasteful use of fire service resources and does not, according to the review, take account of companies' investment in sprinkler and night security. Bain et al. (2002: 35) continues that 'risks move with people' and, as such, the fire service must be able to change the level and weight of fire cover according to the population's movement over a 24 hour period:

The system for deploying the people and resources of the Fire Service was put in place decades ago; it was designed to meet different threats in different circumstances. The emphasis was on putting out fires in buildings. What is needed now is a system which deploys the people and the equipment so they are prepared to deal with the most likely risks of fire in the most cost-effective way, using an approach based on the management of risk which recognises that people move around (Bain et al., 2002: iv).

²⁴ Including: shift patterns based upon demand and changing levels of risk; different crew levels over a 24 hour period; mixing crewing of fire appliances with wholetime and retained firefighters; moving firefighters between stations, specialist functions, and fire authorities; arrangements for planned overtime; and, approval for second jobs (Bain et al., 2002: 98).

The review recommends the introduction of a risk-based approach to fire cover and this means government instructing fire authorities to deploy resources in such a way that 'will save more lives and provide better value for money' (Bain et al., 2002: 39). This includes moving firefighters between crews, shifts, stations and even fire authorities, locating fire appliances in urban and suburban areas in periods of high risk, and, in some circumstances, relocating fire stations where there is historical over-provision. The review acknowledges that this will create a more diverse watch culture, a culture which has been a source of trust, loyalty and union strength historically (see, for example, Fitzgerald and Stirling, 1999), but states that this can be overcome by fostering a wider sense of firefighters' work (see Engeström et al., 2003).

The second recommendation for modernisation is the shift to localised terms, conditions and working practices, and to strengthen local management. Conditions of service for fire service employees from firefighter to, and including, senior divisional officer are contained within the nationally negotiated 'Grey Book' (also known as the National Joint Council for Local Authorities' Fire Brigade Scheme of Conditions of Service). The Grey Book is a nationally agreed collective bargaining agreement between local fire authorities and the FBU and, as such, is not enforceable by statute. However, all fire authorities adopt the Grey Book's terms and conditions and as such its collective agreements are legally enforceable because they form part of employment contracts. Terms and conditions contained within the Grey Book include rank and responsibilities, the shift system and working hours, holiday and sick leave entitlements, pay, allowances and grievance procedures.

The organisation of firefighters' working time and shift patterns is also set down in the Grey Book. Firefighters' shift patterns, known as 'constant crewing', comprise of two day shifts, two night shifts and four days leave (also known as the 2, 2, 4 shift system). Day shifts begin at 9am with a roll-call, followed by appliances checks and training until

lunchtime. Crews undertake a variety of activities in the afternoon including community fire safety and risk inspections, and the day shift finishes at 6pm. After two day shifts firefighters work two night shifts which begin at 6pm with the communication of relevant information from the day shift. Crews then train until around 8pm and then usually eat together. From around 9pm to midnight (but also in some brigades Saturday afternoon, Sundays and Bank Holidays) there is 'stand down' time, which means that crews do not undertake duties other than responding to emergency calls.

Bain et al. (2002: 33) states that there are a number of conditions that explain the lack of change in the fire service in comparison with other parts of the public sector. Firstly, insufficient central government intervention in the form of 'national leadership' to initiate a new direction for the fire service and in the provision of incentives for change. The review does not, however, analyse the modernisation demands by other fire service actors throughout the 1990s, the costs of other public sector reforms which meant that a hands-off approach to the fire service became a pragmatic short-term political strategy, or the funding gap that developed in the 1990s.

The former president of the CACFOA²⁵ and the fire brigades' union would agree that there has been a lack of central government vision and action in relation to the fire service even though there has been significant central government intervention in terms of cutting resources and the introduction of operational performance measures in the 1990s and, more recently, Best Value Reviews. Secondly, the reluctance to change the negotiated order/corporatist structures neglects the demands for modernisation throughout the 1990s by corporatist actors such as CACFOA and the FBU. Thirdly, inflexibility of national rules

²⁵ The then president of the CACFOA, Dennis Davis, stated in his 1995 annual conference address that government's failure to provide a clear direction for the fire service is not a new phenomenon even though within the fire service there is a desire for change: 'But just look at what's happening. At a time when CACFOA members sense real opportunity to move into the next phase of fire service development, to change for the better, to move our community to fire safety, through prevention rather than cure, we are on shifting sands and effectively lost in the fog of indecision' (quoted in Howarth in Hansard, 1996: column 335).

for operational practices and outdated assumptions of risk which are increasingly inappropriate for a society 'on the move'. The review presents the future of the fire service in stark terms. It states that 'while it will be important to maintain the partnership between employers and unions, which has been a feature of the Fire Service arrangements in the past, there must be a clear demarcation of the management role from that of representing members of the service' (Bain et al., 2002: 33).

For Bain et al. (2002: 2) the unequivocal and functional need for a managerialist approach to the fire service is necessary because fire service managers 'are squeezed between national standards of fire cover which no longer protect people adequately, and national terms and conditions designed for working conditions a generation ago'. The review continues that there will be national principles, standards and expectations, although these will not be as extensive as they have been, and that fire service provision should be premised upon devolved decision-making in planning the number of appliances and firefighters needed and the mobilisation of wholetime and/or retained fire crews. Significantly, the role on front-line ICTs in order to foster managerial-led change is, as in the Audit Commission's report, also given very little attention in the Bain review.

4.10 Local Practices, Collective Representation and Fire Crews

The Bain review targets the National Joint Committee (NJC) and the Grey Book as prime examples of out of date institutional practices that are out of fit with local conditions.²⁶ In this sense the review is an attack on the representative actors that take part in the NJC and the concept of negotiated order more generally. The strength of the union has also to be

²⁶ The lack of 'functional fit' extends to the review's conclusion that the firefighting environment is out of fit with what firefighters are trained to do. Bain et al., (2002: 11) draws upon previous fire service studies (e.g., the 'Cunningham Report' (1971) and 'In the Line of Fire' (1995)) and the review team's visits to fire brigades to state that fighting fires comprises of between 3 and 10 per cent of firefighters' working time. The relatively small percentage of time spent on fire incidents is used later in the review to argue for new statutory responsibilities and funding structures for risk management, community fire safety and education, fire safety and 'emergency preparedness' for major incidents (Bain et al., 2002: 31).

situated beyond the NJC and within the particular constellation of the history of recruitment to the fire service, the nature of work undertaken and the wider local and national political context. For example, Baigent (2001) suggests that fire services have been successful in translating 'customer service' into high quality service delivery as opposed to narrower economic criteria and this helps to explain how 1980s levels of service have been largely maintained, particularly during the period of the early to mid-1990s when the then Conservative government was implementing major public sector change (e.g., internal healthcare market, privatisation of utilities). Notwithstanding this, during a debate in the House of Commons, the member for parliament for Nottingham East, John Heppell, related the process of public consultation undertaken by Nottinghamshire County Council in 1995 after it announced potential cuts to services of £50 million, which would have included 200 redundancies in the fire brigade and 10 fewer fire appliances. It provides an example of the importance of the fire service to local constituents, but it also illustrates how local visibility is double-edged because of the potentially detrimental consequences to other services of the local topping-up of the fire service and, further, how this helps to defer the issue of central government funding of the fire service:

The people of Nottinghamshire were faced with cuts in the education service, the provision of social services, teacher numbers and social workers and home-help establishments, but the council received 100 letters stating that the fire service budget should not be cut. That was the priority of those who wrote those letters. It was even more astonishing that there were over 2,500 calls on the hotline. Of those callers, 1,900 gave priority to the fire service. That demonstrates the esteem in which the general public hold the fire service. The Fire Brigades' Union organised a petition, which attracted more than 130,000 signatories. This is a vote of confidence in the fire service, bearing in mind that the population of Nottinghamshire is about 1 million (Heppell in Hansard, 1996: column 328).

Darlington (1997) argues that workplace organisation is, along with high density, a critical condition for trade union resilience. This is connected to the watch shift system, which virtually all senior officers will have been a part of, and the high trust that develops in preparation for and attending incidents. Beyond the immediate organisation of the fire

brigade, connections to the local Labour party, in particular in the context of almost exclusive control of local authorities by Labour councillors at the time the research was conducted,²⁷ has constituted another critical although not immutable condition for the FBU to be able to maintain support and gain extra financial resources for local fire services. But as already mentioned, local union strength has a dual character to the extent that the mobilisation of local support for fire services simultaneously opens a space for action (or non-action) by other actors in other domains: for instance, masking the lack of long-term funding or strategic plans to restructure the fire service at a national level.

There have also been attempts, particularly in the early 1980s, to change the national pay award formula to firefighters put in place after a national strike in 1977-78. The national formula for pay increases and the collective agreement on workplace terms and conditions has been associated with providing stability in industrial relations at a national level. For others, the Grey Book is a barrier to modernisation with, for example, the Bain et al. (2002) translating inflexibility into national terms, conditions and working practices. Stirling and Fitzgerald (1997) provide an analysis of fire service terms and conditions that locates the Grey Book within a longitudinal perspective that dates to the 1970s. They argue that firefighters' conditions and working practices need to be understood as often dating back to the reorganisation of local government in the mid-1970s. Their evidence suggests that terms and conditions often go beyond the Grey Book and that the Grey Book is considered the 'bottom line':

The difficulty this brigade and several others have had is that in those generous days following local government reorganisation in 1974, a lot of local conditions were agreed that were very generous.... Local conditions are now contractual, you can't unilaterally, we're advised by barristers, strip them away. Unfortunately I think a lot of brigades would be delighted if all the conditions of service lay four-square with the Grey Book but unfortunately a lot of the brigades inherited very generous local conditions (Senior Divisional Officer, North Brigade, quoted in Stirling and Fitzgerald, 1997: 49-50).

²⁷ 'Indeed there is only one Conservative-controlled fire authority' (Straw in Hansard, 1996: column 299).

From this officer's perspective it is local terms and conditions, which date back to the early-1970s, that constitute inflexibility rather than national collective agreements, which provide what is considered a basic minimum framework.²⁸ For my purposes it is important to note that Bain et al. (2002) ignore these local terms and conditions in their association of national terms and conditions with inflexibility. The analytical point is that brigades are already based upon devolved agreements and practices and that it is these that are often considered problematic for their efficient operation and the target for reducing costs. *Contra* Bain et al. (2002) the elaboration of national agreements and standardised workplace practice might enhance fire service provision because brigade officers would be provided with clear guidance on the form and content of workplace practice (see FBU, 2002). This would, in addition, be likely to engender greater coherence between brigades and provide a sense of fire service provision beyond the geographical boundary of each fire brigade.

The renaming of retained firefighters to 'proper' part-time status is another illustration of the type of initiative that the Bain review suggests would foster greater managerial flexibility.²⁹ Extending the use of part-time firefighters is an example of numerical and functional flexibility (Atkinson, 1984; for a review see Legge, 1995: 139-73). In terms of numerical flexibility the review recommends that wholetime and retained firefighters should work together as mixed fire crews, retained firefighters should be trained to the same level as wholetime firefighters, and wholetime firefighters be able to undertake the shifts of retained firefighters. Retained firefighters are currently not trained to the same

²⁸ This has to be understood within the historical low remuneration associated with fire service employment and the difficulties of recruitment in the late 1960s (Segars, 1989 in Baigent, 2001).

²⁹ Retained firefighters are part-time fighters who have another job and live and/or work near a fire station. Retained crews are on-call firefighters available throughout the day and comprise of individuals who either live or work in the locality of the station. The majority of retained firefighters are in rural areas (i.e., risk categories D and Remote Rural). Wholetime firefighters are not allowed to work as retained firefighters, and in stations which are made up of wholetime and retained crews, fire appliances are, in the vast majority of brigades, crewed separately (Bain et al., 2002: 25).

level as wholetime firefighters although the Bain review recommends that they should be, so that ‘they provide a resource inter-changeable with that of wholetime firefighters’ (Bain et al., 2002: 107). The review continues that the point of this is to constitute proper part-time, rather than retained, firefighters, who would be guaranteed an income and consistent amount of work. Part-time firefighters would receive a regular monthly wage for a maximum number of hours they would be available and only the number of firefighters needed would attend an incident when they are alerted to one. Functional flexibility would comprise of retained firefighters undertaking activities that have been the preserve of wholetimers. This would include, for example, special service incidents and large fire incidents. Bain et al., (2002) makes little mention, however, of the range of consequences of this form of modernisation in terms of fire crews’ operational efficiency, attendance/performance times and short- and medium-term costs of training. The range of potential effects include, for example, wholetimers having to wait for part-time/retained firefighters to arrive at the station before leaving the station. This would have significant implications on crews’ performance particularly if attendance times remained at current levels. This might also increase the need to have more firefighters at the station at particular times and fewer at other times. Given the funding gap that developed in the 1990s and the ongoing issue of the appropriate level of funding the significant cost of training part-time/retained to the same level as wholetime firefighters, who attend a full-time course for a number of weeks on joining a fire brigade, is significantly absent in the review.

4.11 The Mobile Data Debate: Boundaries and Inter-Operability

It has been suggested above that, throughout the 1980s and 1990s, there has been little emphasis on the role of information and communication technologies in changing fire service provision. The focus, in contrast, has centred upon changing organisational practices. This section focuses on the mobile data debate throughout the 1990s, and, as

such, provides a further lens through which the enactment of demands, tensions and conflicts in relation to efficiency savings, performance measurement and managerialism in the fire service can be understood. It also provides a preface to Chapters 6 to 8, which examine the introduction and use of the VMDS at Hereford and Worcester Fire Brigade.

Use of 'mobile data' by fire crews attending incidents has taken several forms over the last 30 years: first, computerised command and control systems, which mobilise fire crews and track their movement, second, radio communication systems introduced in the 1970s and 1980s, and, third, 'button boxes' and VMDS technologies introduced from the late 1980s and 1990s. Compared to other emergency services, however, there has been little investment in front-line information technologies across UK fire services throughout the 1980s and 1990s (see, for example, Ackroyd et al., 1992). But as discussed above, particularly in the early to mid-1990s when microelectronic innovations were becoming ubiquitous, this lack of investment in information and communication technologies is an instantiation of a tightened financial settlement, a year-on-year increase in brigades' funding gaps, and new demands placed upon brigades. More generally, though, ICTs were not associated with significant change for fire services except in terms of back-office work at command and control rooms.

In addition to the lack of strategic emphasis upon ICTs, definitions of 'mobile data' are far from unequivocal across the fire service and this suggests that there is no single technology or set of practices that can be easily associated with 'mobile data'. Whilst there is a shared sense that 'there is a requirement for effective mobile remote working in the Fire Service and the transfer of information to and from the fire ground' (Fire '97 conference, 1997) the definition of mobile data takes various forms. During the 1990s what counted as mobile data centred around two inter-related issues:

- 1) *Boundaries and connectivity*: does mobile data comprise of incident information held remotely on fire appliances, coded data transmitted from a command and control centre, and/or status updates communicated between fire crews and control rooms? Is mobile data dynamic data (e.g., status updates, etc.) and/or static data (e.g., risk records)?
- 2) *Inter-operability/standardisation*:³⁰ is mobile data available to, and standardised with, other brigades' systems? Are mobile data systems integrated with other emergency services?

Constraints on funding the modernisation of the fire service not only helps to explain why fire services have lagged behind other parts of the public sector in ICT investment, but also helps to explain the enactment of particular boundaries and ascriptions of inter-operability. Hoffman (1991: 18) reported on an Association of County Councils seminar in 1991 which discussed the future of brigade mobilisation and communication systems. At the seminar the head of the G1 division of the Home Office, Peter Spurgeon, stated that financing new systems was a major problem and that 'the prospect of the Home Secretary being able to secure the cash to cover replacement on a one-to-one basis was "pretty remote"', even if 'the Home Office are definitely saying that it will be too expensive to have one fire control for each of the existing fire brigades' (Bassett, 1991: 15). Given this problem of funding and contradictory messages, the Home Office speaker urged the audience of chief fire and local authority officers to 'think in terms of acquiring "mobs and comms" [mobilisation and communication] systems strategically placed in a configuration which would power existing control rooms, but which allow migration and adaptation as the outcome of the Government's review evolved' (Bassett, 1991: 15).

Given the financial retrenchment of the early 1990s, the Home Office's emphasis was upon continuity with the existing brigade-centred approach to mobilisation and communication system procurement and development: that is, new systems added to existing systems and where possible incorporating the functionality to adapt to future changes. In contrast, Keith Phillips, from HM Fire Service Inspectorate, argued that the need to replace mobilisation

³⁰ 'Inter-operability', 'standardisation' and 'inter-brigade working' are used interchangeably at this point. See Chapter 6 and 7 for more detail on what is meant by inter-operability and standardisation.

and communication systems presented an opportunity to 'take a technological and organisational quantum leap' toward 'strategically placed host technology centres to service the needs of brigades irrespective of their operational boundaries' and concluded that 'this arrangement would significantly reduce the resource burden on smaller organisations, yet offer the advantages of sophisticated and highly reliable technology' (Hoffman, 1991: 18).

This chapter has suggested that attempts at external intervention from the Home Office and HMFSI have been challenged from within the fire service on the basis that it constitutes a new form of effectiveness. As part of the seminar, Trevor Bassett, Chief Fire Officer at Dorset Fire Brigade, representing UK fire brigades, analysed inter-operable/standardised fire service control and command centres that Keith Phillips called for and its consequences for brigades. Bassett used a study undertaken in 1990 by consultants from Logica, which recommended that 'standard operating procedures must lay down the course of action to be taken in all circumstances' (Bassett, 1991: 17) and that different brigade practices should be standardised. On the basis that joint command and control centres would not be able to deploy different procedures in different counties he stated that local practice has always been an important mediator of central policy. In addition the 'first question to be answered' is the degree of discretion local fire authorities have:

[W]e all know that the Fire Service is very standardised throughout the country, largely because of the influence of the Central Fire Brigades' Advisory Council machinery.... Having said this, in spite of the common guidance to which we all work, there are some significant variations.... For example, in spite of the model standards of fire cover recommending a one appliance response everywhere except A and B risk areas, most brigades still send two fire engines to all property fires.... Some of us have reduced the attendance to calls which come merely from alarms operating, perhaps during the daytime only. Others still stick to fairly large attendances.

And continued that:

The make-up of appliance fleets is more varied than at first appears to be the case. For example, some brigades have provided all first line appliances with very comprehensive rescue equipment, while others meet the requirement by having a small number of specialised rescue units... Some brigades make sure that fire

engines are booked unavailable if there are less than four riders, while some of us allow the appliance to respond with three in some circumstances (Bassett, 1991: 17).

The issue of effectiveness was analysed in terms of the size of control rooms and the potential consequences for fire appliances being mobilised from joint/regional command and control centres. In terms of larger control rooms Bassett (1991: 17) stated that a recent Audit Commission report on police large control centres concluded that they 'are not significantly more efficient than medium sized ones. They said that if the number of operators in a room grows beyond about six, the additional economies of scale for receiving calls are more limited'. Perhaps more significantly for fire brigades, regional/joint command and control centres may take longer to handle emergency calls because of the way command and control centres operate:

Computerised systems identify the appropriate pre-determined attendance, but I do not think there are many, if any fire brigades who allow the system to automatically actuate fire station turnout systems without intervention from operators. Pre-determined attendances are offered up to operators, who use their discretion to accept or change what the computer suggests ... the operator uses his knowledge of the brigade and brigade policies and with larger controls covering several brigade areas, this would be difficult (Bassett, 1991: 15).

In addition to quality of service issues there are, Bassett continues, cost consequences of increased handling time of emergency calls and this would affect fire crews' ability to meet national attendance times and require increasing the number of firefighters at stations, adding significantly to costs and diverting funds from other parts of the fire brigade.

During the 1980s most brigades implemented command and communication systems from BT or Dowty. In this sense brigades acquired relatively standardised systems even though brigades procured systems independently of each other. Three points are relevant to the boundaries and inter-operability of mobile data in this regard. First, given that existing technological systems are already standardised in a number of functional respects, it is the lack of standardised management practice, accountability and the visibility that this affords

that is critical for the harmonisation of firefighting activity.³¹ Second, Bain et al. (2002) recommends cross-brigade procurement of systems in order to make efficiency savings. This illustrates that what constitutes 'devolved practice' (e.g., local procurement policy) and 'cross-brigade practice and collaboration' (e.g., crew level minimums) is not simply an example of a shift from national to local as the Bain review suggests, but changing configurations of local, regional and national. Third, the predominance of a small number of technology suppliers, which provide relatively standard systems, constitutes a dependency relationship on external commercial enterprises and their decision to maintain or withdraw technical support.

Partly in response to the demand to replace existing mobilisation and communication systems by the mid- to late-1990s the Home Office commissioned a 'Mobile Data Scoping' report. Smith Industries undertook the research with the objective to 'establish what steps the Home Office might take to enable mobile data to be introduced into police forces and fire brigades in the most cost-effective way in the period before the Public Safety Radio Communications Project strategy is implemented' (Fire Service Mobile Data Task Group, 2002: 4).

The Smith report (for more detail see Fire Service Mobile Data Task Group, 2002), which was published in June 1994, made a number of recommendations for mobile data. First, the report recommended common mobilising and communications interfaces between fire brigades thus 'developing and enhancing competition and providing users with a choice of supplier' (Fire Service Mobile Data Task Group, 2002: 4). Second, it was recommended that the primary content of mobile data comprise of communication concerning the mobilising of fire crews and status messages through a standardised interface. Third, the

³¹ In a different empirical context Armstrong (1995: 144) suggests that the ability to calculate and compare through standardised techniques becomes an important source of power and discretion when 'rival profit forecasts involved in takeover battles, for example, call for the expertise of the accountant'.

report recommended that the data required to transmit risk and chemical information, building plans and procedures for firefighters was 'too large for reliable over-air transmission' and thus mobile transmission should not comprise of this type of information i.e., an attempt to define this form of information as not mobile data (Fire Service Mobile Data Task Group, 2002: 5). In other words, what constitutes 'mobile data' is constructed against past assumptions and practices, and current technological 'limits'.

The Smith Report concluded that there was a socio-economic need for harmonised and inter-operable mobile data. More recent policy statements on the fire service have suggested that this functional need has been caused by increasing levels of citizen mobility in advanced societies so that firefighters are not always 'in the right place at the right time' (Bain et al., 2002: 9), and by national security concerns relating to mobility after 11 September (Lord 2002). Within UK fire services the preoccupation with a society on the move is, then, a recent addition to the mobile data debate. Throughout the 1990s and during the period 1996-1997 when the primary fieldwork research was conducted the internal debate within the fire service took two interconnected forms: first, controversies concerning the boundaries and content of mobile data (i.e., status updates, mobilisation, etc.) with the replacement of the existing radio communication network by 2007, and, second, a preoccupation with the desire to standardise practices across fire brigades by enhancing inter-operability of information and communication technologies and the elaboration of administrative performance measures and Best Value Reviews. For example, the 'Vision' for Mobile Data from the Fire Service Mobile Data Task Group is 'relevant, accurate, timely information should be available to all staff at any location from a single source as an integral part of their working environment' (Fire Service Mobile Data Task Group, 2002: 17).

4.12 Concluding Remarks

In summing up changes and continuities in the fire service over the last 25 years it is useful to restate a number of points developed in the chapter. Firstly, there are controversies between executive fire service management, the fire brigades' union and local fire authorities but also agreement on some future developments of the fire service. Secondly, changes in the funding and direction of the fire service illustrate the politically contingent (see Batstone et al., 1984: 50-6) relationship between central government, local authority and fire service. Thirdly, local authorities have often mediated government policy and this has contributed to changing the course of central government initiatives, with most local authorities funding their fire services above the SSA level. The symbolism associated with local fire services, historical high performance of fire crews and union links to labour controlled authorities, has meant that fire service modernisation has been neglected throughout the 1980s and 1990s by a variety of fire service actors. Fourthly, the current modernisation agenda within the fire service (e.g., Bain et al., 2002) is constructed as a shift from national to local working practices and conditions. Understanding the fire service in terms of either national or local practices is, however, rather disingenuous as this kind of dichotomy neglects the mutual dependency of local and national dating back to at least the early 1970s. Instead of an either/or (that is, national or local), the provision of fire services is better analysed as the historical outcome of national, sectoral and local coalitions, decisions and institutionalised practices.

There are also a number of analytical implications for understanding changes in mobile data. Firstly, the definition of mobile data is not a unitary one within the fire service, but is characterised by competing definitions, attempts to connect reform agendas to yet to be made decisions, reinterpretations of government initiatives into brigade specific concerns (such as maintaining professional control over day-to-day activities) and diverging

definitions of risk. Secondly, technological innovation is not a panacea for improving fire services because what counts as 'efficiency' is constructed by attempts to translate standardisation into certain forms and place boundaries around what constitutes mobile data. Thirdly, technologies such as the VMDS standardise 'successfully' only to the extent that they are placed within standardised administrative methodologies and management practices.

Chapter 5: Methodological Design and Empirical Philosophy

5.1 Introduction

The purpose of this chapter is to provide an introduction to the Vehicle Mounted Data System and to set out how the research was conducted from first contact with Hereford and Worcester Fire Brigade to the final stages of writing. The chapter draws upon the previous chapter, which contextualised the provision of fire services in the UK, and Chapter 4, which provided the philosophical rationale for the approach to organisational analysis developed in the thesis. This chapter is divided into five sections. The next section (Section 5.1) sets out the initial reasons for an interest in the VMDS and the negotiation of research access to Hereford and Worcester Fire Brigade. Section 5.2 provides an introduction to the VMDS with a description of the brigade's rationale for its implementation, together with a description of its technical functionality and proposed future developments. Section 5.3 outlines the data collection processes at Hereford and Worcester Fire Brigade. Section 5.4 discusses theoretical and methodological issues and tensions in undertaking research and analysing 'data'. The chapter's concluding remarks briefly set out some of the strengths and limitations of the research in terms of the conduct of fieldwork and analytical contribution.

5.2 Selecting the VMDS and Negotiating Access to Hereford and Worcester Fire Brigade

Undertaking research on the VMDS at Hereford and Worcester Fire Brigade can be understood as related to the hopes, fears and media preoccupation with microelectronic innovations and in part to an interest in the use of information and communication technologies that had come out of previous research on electronic mail at a privatised utility (Brigham and Corbett, 1997). In this sense searching for potential research sites did not begin with a blank sheet of paper but neither did I know before beginning doctoral research what empirical research I would undertake. The decision to undertake research at Hereford

and Worcester Fire Brigade can be understood as a mixture of planning, luck and opportunity. Before starting the doctorate I became interested in undertaking research on information and communication technologies particularly in the context of changing assumptions of place (e.g., long distance control) and time (e.g., archive and real time) and in which issues of mobility and movement were also a preoccupation. This interest seemed relevant and important because, although there was burgeoning empirical research and analytical debate on ICTs in the 1990s (for example, Dutton, 1996), scholarly material analysing spatial and temporal effects of information and communication technologies and mobility was much more sparse (but see, for example, Urry, 2000).

I was initially interested in researching the development and use of information and communication technology in relation to the movement and management of military personnel in a battlefield context (see, for example, Robins and Levidow, 1995). Researching the military sector was however soon discarded given the likelihood of lengthy research access negotiations and significant constraints on research outputs. In February 1997 I searched through on-line archives of Britain's national broadsheets, typing generic keywords such as 'integrated information and communication technologies', 'mobile communications', 'remote working' and 'working at a distance'. One of the on-line articles amongst others that I printed out was entitled 'The brigade's trail-blazers' by Harry Pugh, which began with the intriguing sub-heading: 'A computerised database fitted into fire engines will help in the fight to save lives' (Electronic Telegraph, Issue 468, 3, September 1996). At that time I did not know much about the emergency services in general nor of any research that has been conducted on fire services. The main text of the article read:

The clanging bell and flashing lights remain the same, but [Hereford and Worcester Fire Brigade] has a new piece of equipment that chatters into action as its engines make off for a blaze. Each of the 35 appliances ... has a specially fitted computer fitted in the cab that delivers maps showing the way to the fire, details and plans of the burning building, a high-speed thermal print-out, instructions on how the blaze should be tackled and positions of the nearest water points. The print-out also gives

warning of any hazards the firefighters may encounter, such as stores of explosives or dangerous chemicals, and any valuables, such as historic treasures, they should try to save.... [Hereford and Worcester Fire Brigade] is the first brigade in Britain to fit its machines with a computerised information system. It was initially devised for tanks and aircraft, so it's robust enough to take a few bumps and continue to function reliably. Two of the brigade's firemen died in a blaze that destroyed a large block of the Sun Valley Poultry complex in Hereford in September 1993. They had been trapped after a ceiling collapsed and the dense smoke delayed rescue attempts. Their deaths highlighted the need for on-the-spot information.... Investigators believe that if the brigade had been armed with more details about the geography of the factory, and the risks posed to firemen on the ground floor, the fire would have been tackled in a different way and the two lives would probably not have been lost. Details of thousands of high-risk premises, such as factories, schools, hospitals, hotels and churches, have already been filed, and updates are made every month as fire prevention officers visit more premises.... It is the aim of the brigade to have every building in its area, including residential houses, recorded by next year so that wherever a fire engine is sent, maps and plans will be available at the touch of a button. The cost of fitting the system was £300,000.

The article attracted my attention for a number of analytical and practical reasons. First, it linked to my research interest on mobility and changing work practices. Second, the article presented the 'specially fitted computer' as both a radically new innovation for UK fire service provision and as a technologically driven response to the loss of firefighters' lives. Given an interest in problematising divisions (such as, for example, 'old' and 'new' technologies) and functionalist explanations for organisational change, this innovation seemed to offer fertile ground to research these issues in detail. Third, the brigade was located in one of the neighbouring counties to the West Midlands so conducting the research would be easier and within my budget since I was interested in conducting ethnographic research, that is, in-depth research over an extended period of time.

It was some months later and in conjunction with the rejection of other possible research sites that I contacted Hereford and Worcester Fire Brigade by writing a letter to the Chief Fire Officer on 18 July 1997. I received a reply from the Deputy Chief Fire Officer on 24 July 1997 and spoke by telephone to him on 29 July 1997 at which time I was provided with provisional approval to undertake the research. During the telephone conversation the Deputy Chief Officer remarked that this was 'the kind of project they would like to

facilitate'. I received a letter from the Deputy Chief Officer confirming access a few days later on 31 July, which stated that 'I have now had the opportunity of discussing your proposal with my colleagues and we would be pleased to welcome you into the brigade'. I was of course delighted with this response but nonetheless a little surprised at how easy it had been to get the brigade's agreement to this research and freedom to conduct the research as I considered appropriate.

The Deputy Chief Fire Officer suggested I arrange a meeting with the station officer in charge of the brigade's Operational Intelligence Unit as this was the centre of administrative activity for the VMDS. An initial meeting with the Operational Intelligence Unit took place a couple of weeks later on 15 August at which time I set out my research in more detail and asked for the unit's help in arranging the research. Throughout the period of the research the Operational Intelligence Unit was my base for conducting the research and provided me with contacts, arranged interviews and periods for observation. I was also provided with occasional desk space from which I could make internal telephone calls, search the brigade's management information systems and make notes from archived material and fire service documents held by the unit. Towards the end of the research I was allowed to come and go as I wished from the unit without informing anyone of my arrival during normal day shift hours.

5.3 Introducing the Vehicle Mounted Data System or 'VMDS'

The early history of fire crews carrying useful information in fire appliances dates back to the post-World War II Fire Services Act 1947. Amongst other duties, this placed a statutory responsibility upon newly constituted fire brigades to collect, maintain and disseminate risk records. The rationale was to maintain and improve firefighter safety and to inform decision making at incidents. Over the last 50 years various forms of information have been added

(i.e., records for chemicals and maps) and kept in the cabins of fire appliances. Over the last 25 years some information, such as information on chemicals, has also been transmitted via radio and more recently via in-cabin printers connected to the command and control centre. Cabin printers were introduced in conjunction with what were known as 'button boxes'. These boxes communicated simple status messages between the command and control centre and fire appliances and acted as a supplement to voice communication via radio. In the early 1990s more advanced button boxes were linked to central command and control systems. Several brigades also experimented with facsimile machines as an alternative to the button boxes (Fire Service Mobile Data Task Group, 2002: 4). For a number of decades information has been carried by fire crews, that is, it has been 'on the move' and transmitted by radio so it has been 'mobile'. Yet neither risk records nor transmitted status updates have been seen 'as "mobile data" per se' (Fire Service Mobile Data Task Group, 2002: 8). This lack of an explicit sense of mobile data prefigures the increasing visibility of 'information on the move' within the fire service from the late 1990s onwards.

The Vehicle Mounted Data System (VMDS) is a fire appliance-based, mobile integrated incident information management system and provides standardised and real-time on-screen information to firefighters on the move and at incidents. The VMDS provides, says Goodwin (1997: 39), 'data on mobilisation ... data en route to an incident ... data at the scene'. Hereford and Worcester Fire Brigade installed the VMDS on 36 fire appliances in March 1996 in response to an Improvement Notice served on the brigade by the Health and Safety Executive after the deaths of two of its firefighters in 1993. Thirty commercial companies expressed an initial interest in the advertised tender from which six were short-listed, with Joyce-Loebl Ltd awarded the final contract. The 9.4 inch monochrome VMDS screen and keyboard is mounted on the front dashboard of the fire appliance and linked to an in-cabin thermal printer (see plates 5.3.1 and 5.3.2).

Plates 5.3.1-2: Using the VMDS, and VMDS and Printer, Hereford and Worcester Fire Brigade, 'The Grapevine', Summer 1997



The technical requirements for the VMDS were set out by Chief Fire Officer O'Dwyer (1996: 33-34) included: storage capacity for 2,000 risk records; easy access to information by fire crews; the availability of multiple copies; ease of information update; security of information and an audit trail of information placed on the VMDS (see Table 1, Appendix 3). In addition a sub-set of requirements were also set out, including the use of commercially available software, the technical functionality to add CHEMDATA, GPS/GIS and CCTV, and low-cost administrative support (see Sherrington, 1995). For the chief fire officer VMDS screens bring together a wide range of operational information that was previously paper, appliance or station-based, communicated by radio or kept by watches. The VMDS provides risk information on buildings (also known as the Central Risk Register) with a number supplemented by CAD/CAM (computer aided design and manufacture) building plans; first response tactical plans for large-scale risks; standard incident officer procedures; chemical information (CHEMDATA), which was previously transmitted by radio, and Ordnance Survey (OS) maps detailing water hydrants. The VMDS is updated by Hereford and Worcester Fire Brigade's Operational Intelligence Unit, which is responsible for maintaining risk records from crews' fire safety inspections in the form of two-page VMDS-based Tactical Information Plans (TIP), amending operational procedures, and providing CAD/CAM drawings for central risk records (see plates 5.3.3 to 5.3.6). Hereford and Worcester Fire Brigade produced a new Tactical Information Plan (TIP), which comprised of two pages of 'must have' information. This comprises 'address, station area, map reference, predetermined attendance, directions from the nearest main road, information regarding the structure and location of the premises, significant hazards, site location plans, building construction, water supplies, and any special features regarding the site and materials stored which could be of value to any firefighter' (Goodwin, 1997: 39).

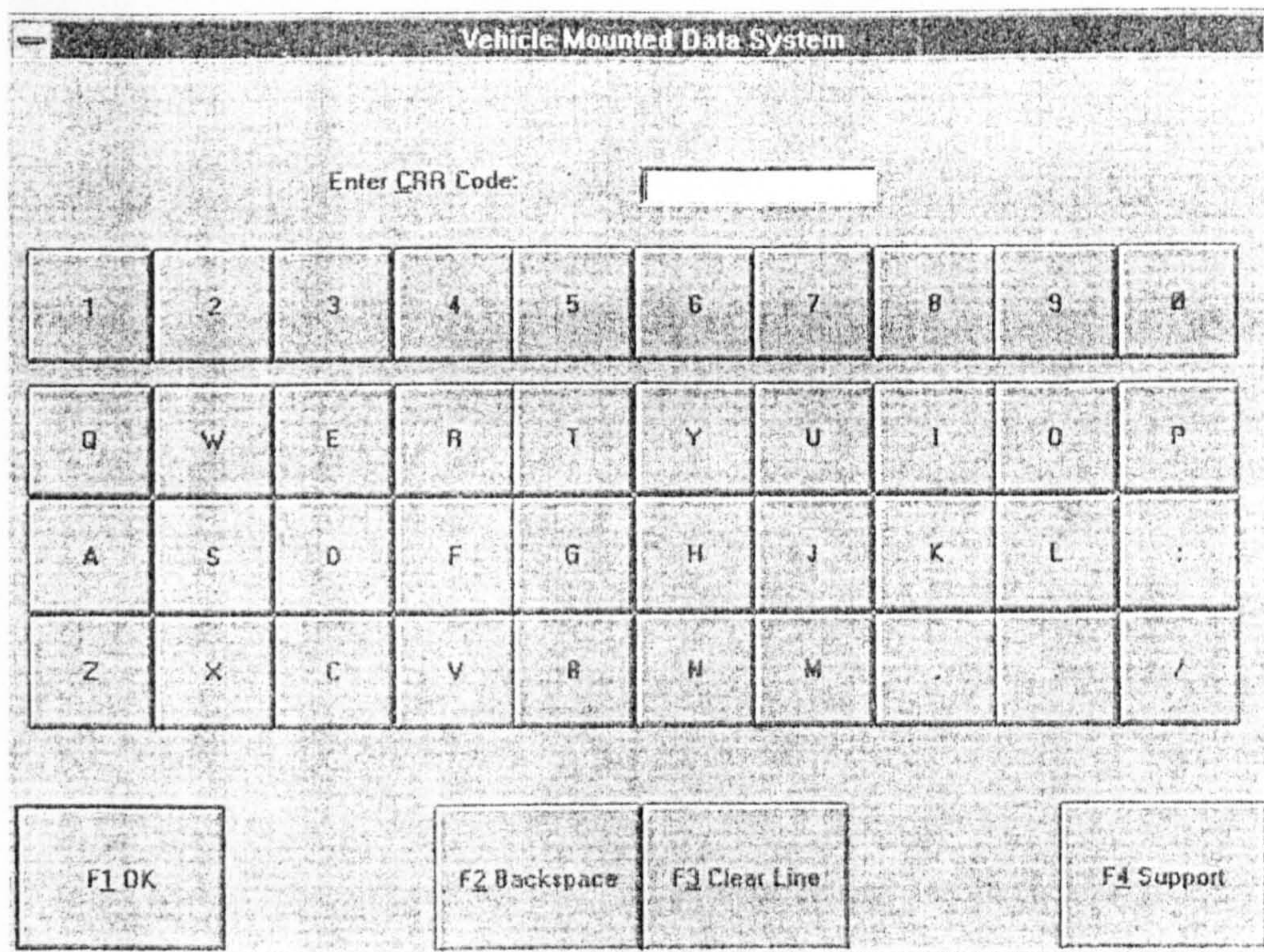
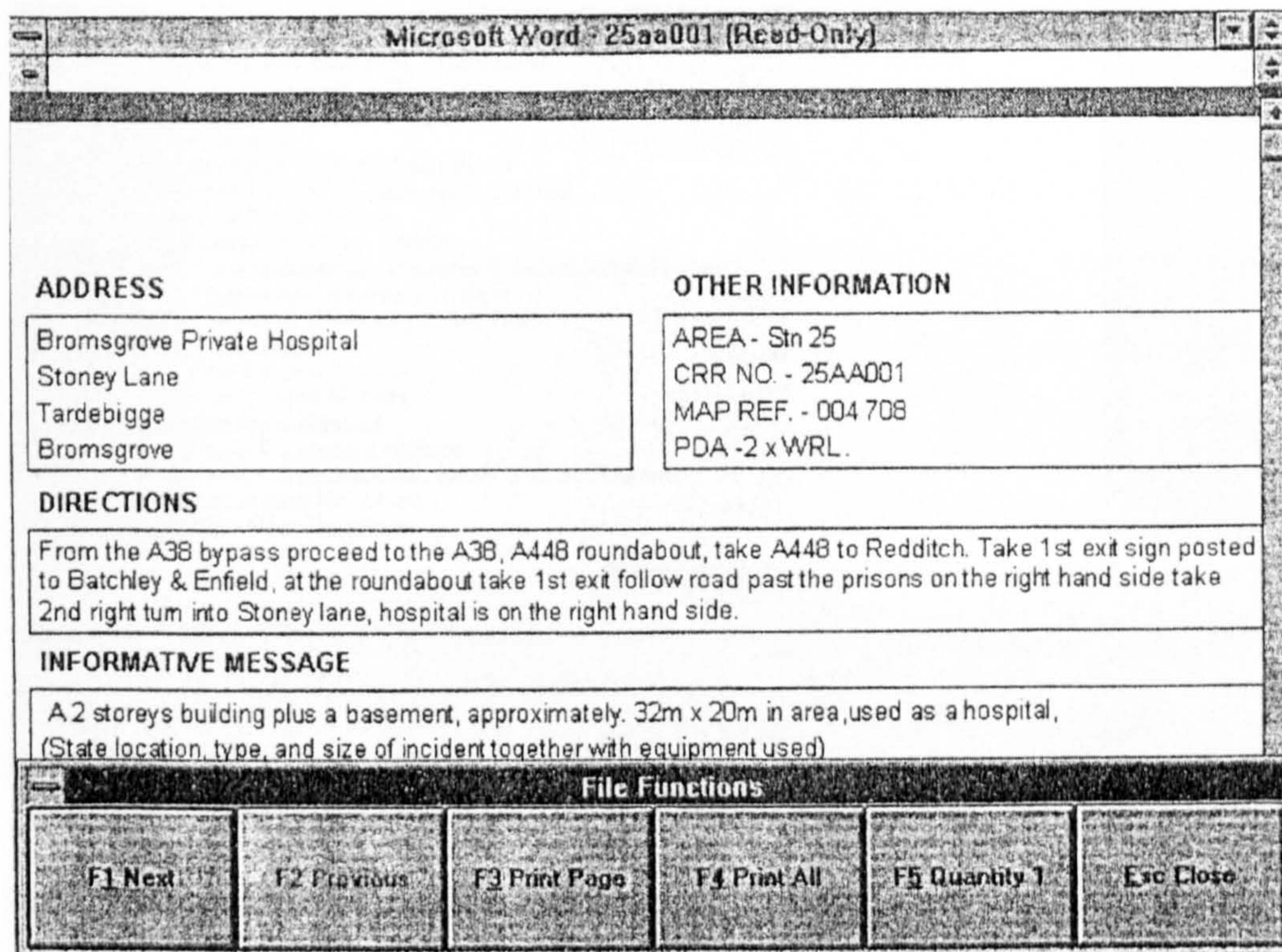


Plate 5.3.3: 'Top Level'/'Ready to Use' VMDS screen with CRR (Central Risk Register) interface. To access risk files the officer in charge enters a seven digit CRR code either provided by either the command and control centre or by searching on-screen or via the keyboard. (VMDS User Manual, Hereford and Worcester Fire Brigade, February 1997). Plate 5.3.4: Detailed CRR information screen, VMDS User Manual, February 1997.



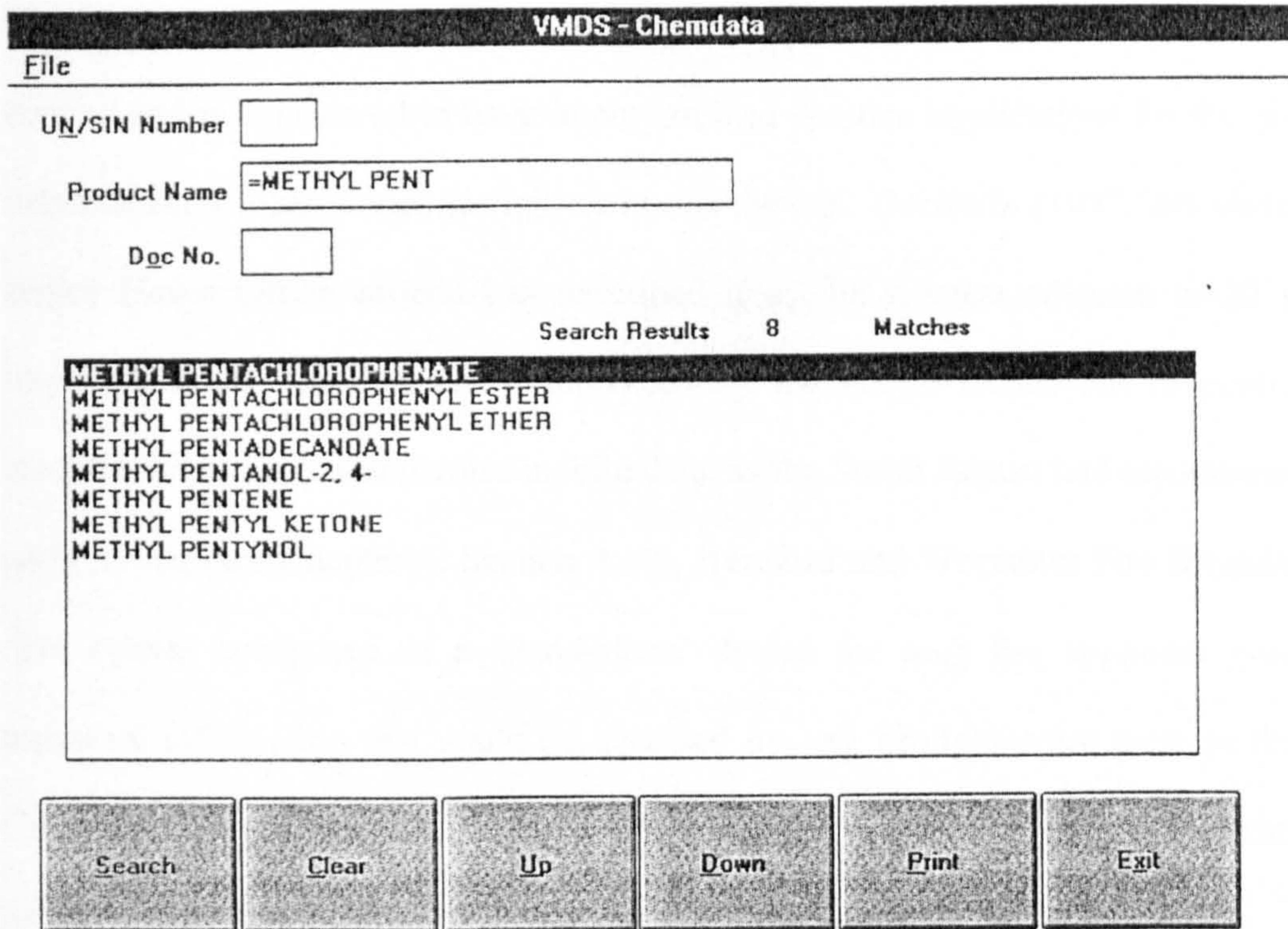


Plate 5.3.5: Chemdata screen, VMDS User Manual, February 1997.

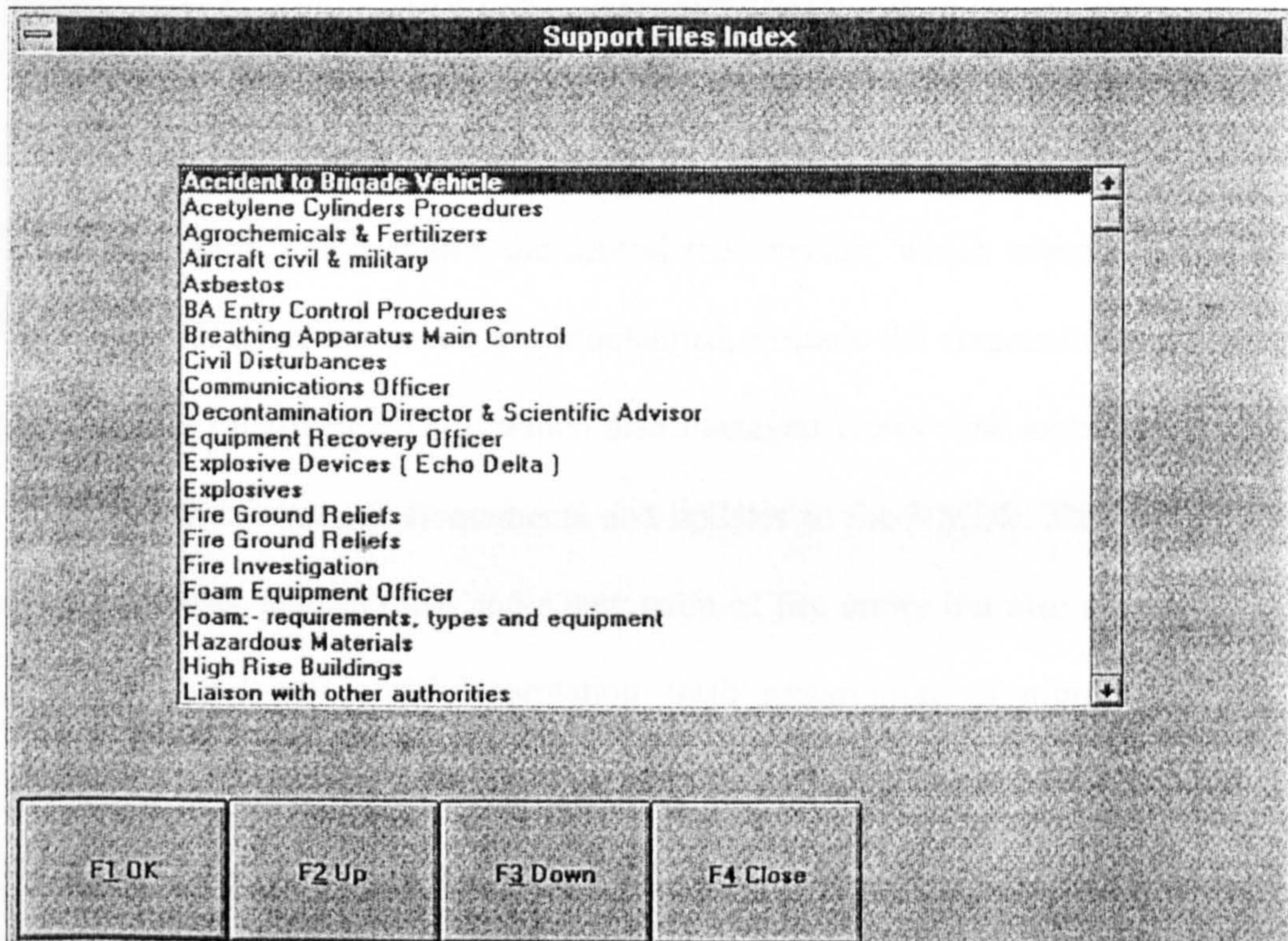


Plate 5.3.6: Standard operating procedures screen, VMDS User Manual, February 1997.

The VMDS at Hereford and Worcester Fire Brigade was the first of its kind in the UK fire service and is considered to have important best practice implications for the provision of information to operational firefighters across the UK. Goodwin (1997: 39) writes that: 'A senior Home Office official has described it as the greatest advance in 20 years'. Its implementation was financially supported by the Home Office but in contrast to the recommendations to standardise mobile data, as the Smith Report had recommended in the early 1990s (see Chapter 4, Section 4.10), Hereford and Worcester Fire Brigade's mobile data system comprised of a 'stand-alone' device for each fire appliance consisting of universal information that could be accessed by any firefighter/fire crew in the brigade. Crew mobilising communication and status messages, a central part of the Smith report's recommendations, were set aside, at least at the time the VMDS was introduced.

The VMDS provided, then, unprecedented levels of information to front-line fire crews from which three initial analytical observations are worth noting at this point. First, the VMDS can be understood as simultaneously centralising and decentralising the coordination and control of information to front-line fire crews (see also Bloomfield and Coombs, 1992). For example, the central risk register, which comprised risk records and had been watch/station based and maintained, became the responsibility of the centralised Operational Intelligence Unit, which also managed crews' risk assessment guidelines and protocols, the timing of assessments and updates to the VMDS. This institutionalised not only the closer management and supervision of fire crews but also separated the planning and execution together with information 'push' assumptions of information transfer from a centralised base. This centralisation also placed new emphasis upon the quality of information administered by the Operational Intelligence Unit. By contrast, the VMDS can be understood as decentralising information in two senses, one related to the social organisation of crews at incidents, the other the non-discursive ordering of technological

equipment: i) decentralisation as access to the same information replaced the previous decentralised practice of fire crews having to share limited paper copies of station maintained records at incidents,³² and, ii) decentralisation of the storage of data to the 'stand-alone' VMDS bolted to the dashboards of fire appliances.

Second, the VMDS can be understood as an archetypical Enlightenment device: the VMDS affords augmented access to information (that is to say, the 'light' that universal knowledge casts upon previously shadowy realms of narrow local order) and is small (that is to say, it is lighter in weight and reduced in size) compared to previous paper-based forms of information (dual meaning of Enlightenment attributed to John Law). This presaged the reorganisation of firefighters' work around universally shared and mobile information. Third, the relative geographical remoteness and invisibility of the brigade in comparison to larger metropolitan brigades, which previously had meant that it had been a laggard in most national developments and innovations and not part of any national review (e.g., the Audit Commission's 1995 report) was turned into a potential advantage with the distance defying VMDS. For example, Goodwin (1997: 39-41) writes that it is also envisaged that, in the future, the VMDS will provide dynamic assessments of the road conditions, automatically show the location of the incident, the best route and the location of other fire appliances. Other possibilities include the option to complete important reports and investigations at an incident, providing weather conditions and forecasts, and better communication between fire crews.

³² 'Turnout area'/'turnout boundary' is the geographical area of responsibility around stations. It is sometimes termed 'patch' by fire crews. It is regular practice, in instances of large-scale incidents, etc., for fire crews to work beyond these boundaries even though firefighters are permanently allocated to a designated station.

5.4 Sources of Data and Research Sites

Innovations in microelectronic technology and their proliferation in workplaces have occurred in conjunction with a rediscovery of anthropologically inspired research practice (see, for example, Zuboff, 1988). This rediscovery of in-depth and ethnographically inspired research is contrary to some predictions that social scientific research would have little to say about 'hard' or 'asocial' technologies. Instead there has been a minor revolution in the study of organisations over the last two decades (see Burrell and Morgan, 1979; Reed, 1985; Denzin and Lincoln, 1994; Bryman, 1988; Silverman, 2000). In terms of in-depth studies of workplaces and organisations, recent developments must also be situated within ethnographic approaches pioneered and inspired by, for instance, Beatrice and Sydney Webb (1932), the Chicago School from the 1920s onwards (Whyte, 1984), and workplace studies by Roy (1960), Lupton (1963) and Beynon (1973) (for a review, see Gill and Johnson, 1997).

Despite the interest in studying the practices associated with information and communication technologies, including studies of the social organisation of industrial activity such as Delbridge (1998), organisation theory has been as concerned with intellectual debates relating to the status of the field of organisational analysis and meta-level controversies (see Burrell and Morgan, 1979). In this context, the concerns of ethnographic-inspired research has been taken up over the last 25 years by a heterogeneous constellation of researchers who have elaborated many novel thematic interests and analytical resources. This is comprised of studies, often at the margins of the field of organisation studies, of workplace practices (e.g., Barley and Orr, 1997; Heath and Luff, 2000; Suchman, 1987), information systems (e.g., Yates and Van Maanen, 2001; Harper and Hughes, 1993; Bowker and Star, 1999), and science and technology (e.g., Latour and Woolgar, 1979; Berg, 1997, 1999; see also Chapter 9).

This research has adopted a range of ethnographic processes and practices, that is to say, observation, participation, interviews and the use of archives (Hammersley, 1990, 1992). Given the questions I was interested in researching this was the most appropriate way to conduct the research. The majority of the interviews and observation at Hereford and Worcester Fire Brigade took place over eight months between August 1997 and April 1998, although I continued to collect documentary material on the VMDS, Hereford and Worcester Fire Brigade and the fire service more generally throughout the late 1990s and until the final stages of writing up. At the time the research was conducted Hereford and Worcester Fire Brigade was divided into four districts/business units: North, South, West and Central. Research was undertaken with the busiest fire stations in each district, apart from one station in North district, the Operational Intelligence Unit, the command and control centre, and the brigade's headquarters (see Table 2, Appendix 3 for more detail of the research sites, plus Table 3, Appendix 3 for incident statistics).

Research focused on firefighters' practice and use of the VMDS but also on the implementation of the VMDS. In the early months of the research the station officer in charge of the Operational Intelligence Unit often made arrangements for me to interview officers and fire crews and to observe watch activity. On other occasions, as officers at Hereford and Worcester Fire Brigade became more familiar with the research, it was often suggested that I contact a particular individual, watch or station. Before interviewing an individual at Hereford and Worcester Fire Brigade I wrote an informal letter introducing myself and included a one-page summary of the research. The letter and outline provided those I interviewed and observed with a statement about the research as empirical material for a doctorate degree at the University of Warwick, the nature of the research including

broad research questions,³³ how I envisaged material to be collected, a timetable for the research and a statement about confidentiality and anonymity. I usually followed up the letter with a telephone call a week or so later. On a number of occasions, particularly after I became more known at the brigade, I also telephoned an individual directly from the Operational Intelligence Unit without sending a prior letter of introduction.

5.4.3 Interviews

The vast majority of Hereford and Worcester Fire Brigade firefighters and headquarters staff interviewed were wholtime or full-time non-uniformed staff. Over the course of the research twenty-four semi-structured and taped interviews were conducted comprising of the deputy chief fire officer, divisional officers, assistant divisional officers, station officers, sub-officers, watch commanders, leading firefighters and firefighters. Interviews lasted from 45 minutes to a number of hours. More informal interviews, which were usually not recorded, were conducted with nine wholtime day and night fire crews as well as with individual firefighters and these, along with taped interviews, comprised of a significant part of the field research. Recorded interviews were also undertaken with the three members of the Operational Intelligence Unit, in conjunction with a number of shorter interviews at which notes were taken. The coordinator of the command and control centre was interviewed on two occasions and the control centre staff were interviewed as a group between emergency calls.

For each station that was crewed 24 hours I arranged to interview both the day and night watches. I also returned to stations a number of times over the eight month research period

³³ The objectives/research questions included in this document were to: i) examine how the introduction of on-board information and communication technologies, which contain operational procedures, digitised maps, risk files and other data is reorganising and redefining the work of firefighting at stations and in fire appliances; ii) explore how the provision of instantaneous and detailed information about an emergency situation affects the coordination of firefighting activity; and, iii) analyse how the introduction of on-board information and communication technology is affecting how the brigade's fire appliances and stations work and communicate with each other, and are creating new responsibilities for the management of firefighting.

to conduct follow up interviews or conduct interviews with crews not yet encountered. Informal interviews with individual firefighters or the entire fire crew were often conducted during the stand-down time after 9pm when firefighters could be interviewed at length. These group discussions often continued late into the evening and sometimes into the early hours. In circumstances where recording was not appropriate notes were made during discussions and written up with comments and reflections afterwards. I also arranged to interview one retained firefighting crew during their weekly training evening although in general researching retained crews proved difficult as these crews had to undertake planned training activities when they were at the station. Informal interviews were also conducted with senior officers from brigades across the UK at the annual Fire Service Research Day in 1997 and in 1998, including senior officers from Strathclyde Fire Service, who were working collaboratively with Hereford and Worcester Fire Brigade on developing a remote transmission system from the command and control centre to the VMDS on fire appliances (see also Humphreys, 1997: 40-1).

During interviews I found it was helpful to ask open-ended questions even if interviewees asked for clarification of the meaning of the question. This often meant that the interview drifted to topics, controversies and debates that were unrelated (or at least it could be easy to assume this during the interview) to the specific focus on the VMDS. Not surprisingly, though, it was often such interviews that provided the research with an expanded focus or interesting connection to follow up in more depth. I reminded myself to make sure that I listened more than I talked and not to interrupt interviewees. I also found it useful to summarise back to interviewees points made to me as a way of focusing on particular issues in more detail and clarifying my understanding.

The purpose of each interview was to get interviewees to, first, explain in detail how the VMDS was used, why it was implemented and how it connected to wider brigade practice;

second, to provide a temporal account of the VMDS and, third, to probe controversies and their resolution, competing rhetorics and boundary making work. I always began interviews by asking interviewees about their work and how it had changed over their working life at Hereford and Worcester Fire Brigade. Interviews typically began with an individual's role and their views on changes in the fire service. Before beginning an interview I always sought agreement to make notes and tape record the discussion, which was agreed in all but one interview. Informal interviews, often arranged while I was at a station, were, where appropriate, recorded although this was not always appropriate particularly when firefighters demonstrated the VMDS inside the fire appliance.

The semi-structured interviews followed a generic format unless there were particular reasons not to do this. I used a pro-forma sheet comprised of pre-interview background to the research, my status as a doctoral researcher independent of Hereford and Worcester Fire Brigade, a negotiation of the length of the interview, and a statement about the confidentiality and anonymity of the interview material in academic outputs. In terms of questions and themes the pro-forma developed over the period of the research as I became more familiar with issues and debates at Hereford and Worcester Fire Brigade

In order to structure the interviews the pro-forma sheet comprised of seven thematic sections: i) the past and present work of a firefighter/officer, etc.; ii) the practice of using the VMDS compared to the previous practice; iii) different rhetorical views and controversies related to the VMDS, particularly in relation to mobile data across fire services; iv) how the VMDS is contextualised and decontextualised, v) the organisation of fire crews' work; vi) communication between fire crews and the command and control centre; vii) the collection and assessment of risk information; and, a final section in which I noted brief personal details related to their work and provided interviewees with the opportunity to ask questions and then thanked them for their time. I usually asked

interviewees for recommendations of others I should speak to if it had not come up during the interview. In addition before and after interviews I would hang around stations reading notice-boards and introducing myself to fire crews, watch commanders and sub-officers. This helped in arranging future interviews as fire crews became familiar with seeing me around.

5.4.4 Observation and Participation

An initial challenge for the researcher is to make sense of the unfamiliar research setting but also to use it as a resource. Observation and non-direct forms of participation took place at a number of sites both within and externally to Hereford and Worcester Fire Brigade. Within the brigade this included watches at five stations, with week periods at stations one and three, the Operational Intelligence Unit and the command and control centre.

Observation at fire stations involved becoming part of the highly institutionalised routines of fire crew work as much as possible for a non-firefighter. No doubt my gender helped in this because crews were all male apart from one or two exceptions. At times I felt like I was treated as a new and enthusiastic recruit who was being initiated into the brigade. I dressed in an appropriate way (e.g., smart jacket or fleece jumper) depending upon who was being interviewed. I talked to firefighters while they checked and cleaned appliances and equipment, offering to help them with their station duties, and discussed their work during tea and lunch breaks as part of the process of 'bottom up' access. I participated in the everyday activity of the station, going to, for example, risk/building assessments and community safety visits, but also to fish and chip shops for evening meals and helping tidy up the station in the evening. During these observation periods I was attentive to the organisation of fire crews' everyday work. Whenever I could I made the most of the 'stand-down' time from around 9pm in the evening when firefighters had completed their roll-call,

checks and training and were able to relax and discuss their work at length. It was often during this period that I was able to get firefighters to demonstrate the VMDS in the fire appliance without the interruptions of the structured daytime workplace routine.

Demonstrations became an important feature of the research even though fire crews often thought of them as unimportant because they thought they were 'just showing me' the VMDS. More often than not demonstrations turned into animated group events as either the VMDS would not do what a firefighter wanted or a firefighter did not know how to answer a particular question using the VMDS. It was also during these demonstrations that previous forms of work organisation, particularly the pre-VMDS paper-based risk records were discussed and often shown to me. I made notes in my research diary during demonstrations or immediately afterwards with reflections on the demonstration. In addition I made notes of, for example, the physical architecture of stations, the internal layout and decor, pictures of incidents at entrances, the storage of equipment/tools/records, the location and content of notice-boards, and station PCs.

The Operational Intelligence Unit was the primary base for research and it was easier and less obtrusive to observe everyday activity and discussion as the officers were located in one room, which was small enough to overhear conversations, and officers got used to my presence, particularly when I was given a temporary desk to work from. Observation also involved shadowing the unit's sub-officers as they went about their work—telephoning stations to chase risk assessment forms, preparing for meetings to discuss the future development of the VMDS, etc.,—and this provided occasions for me to ask the officers to explain their work in detail. Over time and as trust and understanding was built up I was asked for my opinion on the VMDS and the future of the fire brigade more generally. Towards the end of the research the unit's officers began to have a clearer sense of how I

was conducting the research and became more proactive in providing me with documentary material and contacts that they thought I would find useful.

Observation also comprised of a week at Hereford and Worcester Fire Brigade's command and control room, observing emergency calls and the mobilisation of fire appliances and interviewing control room staff. Unlike the rest of the brigade, which was virtually all male, command and control centre staff were all female including the control room's line manager. For the week I observed the rotating shifts work I was given a desk in a corner of the control room and told I could conduct observation as I wished but only interview when control staff were not responding to an emergency call. Although the command and control room was not the main focus of the research, observation of the control room staff provided insights into the collaboration of control room staff when an emergency call was received, their interaction with the mobilisation system and the situational mixture of standardised and improvised work between control room staff and fire crews when an incident is underway.

I also observed a number of formal and informal meetings related to the development of the VMDS. During the period of the research the assistant divisional officer in charge of the VMDS at Hereford and Worcester Fire Brigade was conducting a trial development of the VMDS as a device for transmitting 'structured information' including status information (e.g., such as attending an incident, further fire appliances needed, ambulance/police required) between the control room and fire crews and the initiation of VMDS screen printout by remote trigger (see Chapter 4, Section 4.10). Participation and observation also comprised of informal meetings at the Operational Intelligence Unit, which I could contribute to or organise myself if I wanted to discuss research related issues. Beyond the immediate internal organisational boundaries of the brigade I observed a number of risk

assessments, building inspections and community fire safety talks by fire crews during day watches.

National fire service exhibitions and conferences were also attended. This included observing and talking to participants at the national Fire '97 exhibition and the conference for the Federation of British Fire Organisations in mid-September in Bournemouth at which Hereford and Worcester Fire Brigade and Joyce-Loebl Ltd demonstrated the VMDS as part of the Federation's first 'IT village'. I also attended the Mobile Data workshop, which was a stream at the conference. I participated in National Fire Service Research Days in 1997 and 1998. This provided the opportunity to present emerging research with senior officers from across the fire service. Research days also included a demonstration of officers' training facilities such as simulated fire incidents using specially designed buildings.

5.4.5 Archives and Documents

Documentary material is a constitutive part of the empirical material used in this thesis and in this sense the typical hierarchy between 'secondary' and 'primary' empirical material is rejected. Archive material was gathered from a variety of sources and comprised of documents from Hereford and Worcester Fire Brigade, the UK fire services, the firefighters' union and senior officers' representatives, the local fire authority and central government bodies. Documentation from Hereford and Worcester Fire Brigade, which did not have a centralised brigade library/archive, was collected from the headquarters, the Operational Intelligence Unit, stations and from fire crews. Documents comprised, more specifically, of internal brigade newsletters and communications (e.g., 'The Grapevine'); training documentation for the VMDS; the VMDS user manual (Issue 2AK1, 1997); VMDS and Tactical Information Plan PowerPoint presentations; minutes of meetings regarding future development of the VMDS; VMDS-based risk records (i.e., 1.(1).D

records) and paper 1.(1).D records dating back to the 1980s; pre-VMDS 1.(1).D training files; paper and VMDS based-Chemdata records; the VMDS officers' handbook (Issue 1, 1996); VMDS Ordnance Survey maps; VMDS training and maintenance schedules; policy documentation produced by the Operational Intelligence Unit; organisational charts for 1997-1998; the brigade business plan for 1997; brigade risk management action plans; brigade performance plans; minutes from brigade/local authority budget meetings; HMFSI performance reviews and yearly inspection reports of the brigade; and the brigade's annual report and accounts from the late 1990s onwards.

Archival research was also undertaken on occasional days over a number of months at the National Fire Service College library in Moreton in Marsh. This provided access to, for example, government reports, historical material on the fire service (e.g., Blackstone, 1957), and scholarly research specific to the fire service (e.g., Fire Engineers' Journal). Documentary material beyond the brigade included documents and reports available on government websites (e.g., the Home Office, the Office of the Deputy Prime Minister, the Audit Commission, HM Fire Service Inspectorate, Chief Fire Inspector reports), bodies representing firefighters (e.g., Fire Brigades' Union (FBU)) and senior officers (e.g., Chief and Assistant Chief Fire Officers' Association (CACFOA)), and publications relating to the fire service. Relevant parliamentary debates accessed in Hansard were read in order to develop an understanding of national and local contexts of fire service provision.

5.5 Analysing Data: Empirical Philosophy

It is now widely accepted across the social sciences that research data is immanent to social and historical contexts and that research agendas are organised around ideas, practices, preoccupations and interests. Not only does 'data' not speak for itself but from Kuhn (1962) onwards it has been argued that theoretical development is driven by changes in

intellectual vision as much as by new empirical discoveries. Undertaking research—empirical philosophy according to Law (2002)—is usefully thought of as a creative and imaginative act, and not simply a process of discovery, that simultaneously constitutes the identity of the researcher and provides, at best, new images for thought and practice.³⁴

This research draws upon concepts from actor-network theory, post-structuralist approaches to organisational analysis and ethnographic studies of workplace practice. It also starts from the proposition that ontological, epistemological and methodological practices are tightly-coupled (see, for example, Chia 1996; Burrell and Morgan, 1979). In researching and analysing the VMDS a range of analytical routes into the empirical material were deployed. This included, firstly, analysing the translations and transformations that occur in *the everyday use of the VMDS*, including, for instance, the ways in which fire crews work around the limitations of the VMDS in maintaining co-ordination (see also Berg, 1997). Second, it meant accounting for *how the VMDS acts as a performative resource* for boundary making, context enactment and controversy resolution between particular visions of the technological, organisational and managerial and how this is related to power (see also Bloomfield and Vurdubakis, 1994). Third, following *how the VMDS is contextualised and decontextualised* over different times and places within Hereford and Worcester Fire Brigade and UK fire services and how this is constitutive of the VMDS (see also Latour, 1999). Fourth, elaborating how *the historical narrative of the VMDS* comes to be that of a relatively unproblematic and rational solution to a functionalist need for enhanced reliability and more comprehensive information (see also Hoskin and Macve, 1998).

Undertaking research is never a matter of collecting empirical material and not knowing what to do with it all or complete certainty in writing up data that has been gathered (for a discussion of this see Silverman, 2000: 119). After the initial high of gaining what can be

³⁴ The role of the researcher is, then, about creating relationships between distinct but connected contexts, a point discussed below, through acts of imagination, discovery, collaboration and co-option.

considered high-quality research access I became a little disheartened as the VMDS was far from what I had expected—for instance, it seemed that firefighters did not use the VMDS that much and the information that was kept on the VMDS was more limited than I had been led to believe while negotiating access to Hereford and Worcester Fire Brigade's 'revolutionary technology'. Sotro (1996) argues that resisting the revolutionary rhetoric of information technology is a constitutive part of undermining the unidirectional instrumental view that technology 'supports' or 'enhances' human abilities. Sotro, in contrast, argues that IT may in fact challenge the primacy of human ways of knowing:

The introduction of IT devices in society and organisations will often appear to the users to be provoking sudden radical changes. The automation of a plant, the replacement of manual operations by computers, etc., are certainly experienced as rapid and drastic transformations. But considered in the broader perspective of the dissemination of IT in human settings, these changes immediately appear as extremely punctual. They are no more than partial implementations contributing to a slow process of computerisation. Not only do most well-established IT devices fail to live up to their promised instrumental values, but even advanced IT products are often only very partially usable (Sotro, 1996: 26-27).

Sotro suggests that it is in part because IT innovations fail to live up to their revolutionary rhetoric that a form of analysis not so concerned with the gravity or functionality of information and communication technologies is warranted. For Sotro (1996: 27) this means analysing ICTs in terms of their ontological status and this means 'first of all considering the ways in which IT artefacts "exist" in the world and what qualities characterise them. This also entails the necessity to examine how IT devices frame our modes of relating to them'.

Initial ordering followed the categories on the interview pro-forma but after a number of interviews and observations were completed field material was re-examined and reorganised to connect with theoretical issues and concerns: the relationship between data and theory can be understood as recursive with deployment of theoretical approaches

occurring in conjunction with fieldwork.³⁵ Getting beyond from revolutionary rhetoric, in terms of the research practice, meant that research material had to be ordered and re-ordered a number of times over an extended period. This comprised of, for example, shifting from initial themes which ordered material into the functions and uses of the VMDS to themes centred upon the actor-network of conditions for particular ways of using and relating to the VMDS.³⁶ Before reaching this point of understanding it can, however, be easy for the relatively novice researcher to encounter these shifts as an instantiation of the weakness of the research design. Yet as I am sure experienced researchers might often remark it is these highs and lows that help to induce, when anxieties are translated into analytical concerns, the basis of research insights.

Deleuze and Guattari are similarly interested in divisions that produce ways of seeing and not seeing and the productivity of power/knowledge. They are also, as discussed in Chapter 3, interested in the relationship between being and becoming. Deleuze and Guattari describe difference in different ways as a constant reminder to the reader of their central message: that difference is ontological, that is to say, difference is the nature of being (more appropriately 'becoming being') that is a non-essentialist realism. For the researcher interested in experimenting with Deleuze and Guattari's work the task is of providing a constitutive exposition of this non-essentialist ontology in relation to the particular research. I set out in Chapter 3 how Deleuze and Guattari, and others such as Nietzsche and Bergson, are interested in privileging becoming over being, but that this inversion of the dominant history of western philosophical requires more than a simple reversal of a

³⁵ Other divisions include researcher/lecturer, husband/father. Developing new lecture material and changing nappies are similarly inseparable from research (and welcome distractions!).

³⁶ Material collected was ordered into a number of thematic/analytic categories. These included 'loss of life', 'standardisation/interoperability', 'assessing risk', 'boundaries of mobile data/work', 'universal access', 'paper based technology', 'translation, global crewing and connectivity to command and control', 'multiple use of the VMDS at incidents', 'fire crew work organisation', 'performance measurement', 'memory/forgetting', 'demonstrations', 'future development', and 'fire service context'. Thematic categories were, of course, not mutually exclusive and data in one category were often repeated in another. Categorisation of empirical material is a way of seeing and not seeing and recognition of this provided the basis for research material to be reworked over time.

hierarchy between being and becoming that I associated with prominent process thinkers in organisational theory (e.g., Chia, 2003). To recap very briefly, it was suggested that reversing the hierarchy of being and becoming is problematic in two ways. First, it is the approach to the evaluation of phenomena that is important, with an emphasis upon deploying a particular quality of the will to power that, in Nietzsche's terms, is active rather than reactive. Second, despite the abstract opposition between becoming and being (also termed difference and repetition), which persists

we must indicate a much more complex difference ... we must remind ourselves that the two spaces in fact exist only in a mixture: smooth space is constantly being translated, transversed into a striated space; striated space is constantly being reversed, returned to a smooth space.... It is as though smooth space emanated, sprang from a striated space, but not without a correlation between the two, a recapitulation of one in the other, a furtherance of one through the other (Deleuze and Guattari, 1988: 474-77, emphasis added).

For Deleuze and Guattari the relationship between being and becoming is one of mixtures and purifications comprised of translations, lines of flight, striations, and royal and nomad science. Faulkner (1956: 151) describes the effects of the methodological tension of doing research with a useful analogy:

She had been working on it for fifteen years, carrying about with her a shapeless bag of dingy, threadbare brocade containing odds and ends of coloured fabric in all possible shapes. She could never bring herself to trim them to any pattern; so she shifted and fitted and mused and fitted and shifted them like pieces of a patient puzzle-picture, trying to fit them to a pattern or create a pattern out of them without using her scissors, smoothing her coloured scraps with flaccid, putty-coloured fingers (Faulkner, 1956: 151, quoted in Deleuze and Guattari, 1988: 476).

Another way of saying this is that, firstly, the VMDS was very rarely on its own, and, secondly, writing up research is about the production of scholarly identity. In terms of the first point, whilst conducting the research the relational character of the VMDS kept turning up—something which can be understood as an ethnographic insight on the problematic of the VMDS and which came out of the research and wide-ranging reading. Latour provides a way through the infinite 'odds and ends' of research material. His response to the issue of where to stop the analysis—that is, 'to trim them to any pattern'—is to pose the question:

At what point do researchers stop 'following the actors' in the construction of actor-network? Latour's solution, and response to the second issue, is to 'stop where the actors stop'. In other words follow the translations and purifications until the actors themselves stop.

The combinations of 'reality, language, society and being' reconfigure the human condition into a 'weaver of morphisms' (Latour 1993: 137); elsewhere, Latour describes this as mediation (Latour, 1994). As a 'weaver of morphisms' the human is not so much anthropocentric as what Lash (1999) calls the passing or sending of 'technomorphisms, ideomorphisms, theomorphisms, sociomorphisms and psychomorphisms', to name a few. It is here that Latour defines the human and therefore actants generally in terms of 'redistributed humanism'. For some, this might be understood as removing the spark of humanism that attributed action to a privileged few; for Latour it inaugurates openness and irreducibility because to be 'human is the delegation itself, in the *pass*, in the *sending*, in the continuous exchange of forms.... Human nature is the set of its delegates and its representatives, its figures and its messengers (Latour, 1993: 138, emphasis added).

It is in the communicative 'passing' or 'sending' that judging occurs and morphs a heterogeneous network. Like Latour, Lash (1999: 276) discusses 'sending' not in terms of representation but as the transmission of judgement, that is to say, there is no judgement without communicating judgement because 'late-modern culture ... can never represent without sending, without transmitting or communicating'. However, Lash adds the contention that 'Latour may become unwound in a contradiction'. The contradiction comes from the judging and passing of quasi-subjects and quasi-objects and the call to social scientists to 'follow the actors' or 'track the object' as if Latour is an objective observer. As Lash makes clear this makes Latour 'insufficiently reflexive' to what constitutes judging and following/tracking. First, judging, which must occur, is more typical of the modern

constitution than the amodern Latour proposes. Second, Latour claims that social scientists should follow the proliferation of hybrids or ‘shadow the quasi-objects’ in order to discover the network and the attribution of human and nonhuman into stabilised properties. For Lash (1999: 276-77):

This ‘shadowing’ or tracking sounds a lot more like the work of a detective than the work of a judge. And perhaps this is what we are about in the global informational culture. We non-moderns are perhaps not ‘judges’ at all, but ‘trackers’.... And note that much of the time we make sense through practices of orientation that do *not* involve making meaning. We non-moderns are not mediators but materialist ‘trackers’, pathfinders.

Lash (1999) is correct to point out that judging-through-passing is not the same as tracking-by-following-actors. Refiguring actor-network theory’s symmetrical anthropology would therefore mean becoming concerned with showing how actants—quasi-subjects and quasi-objects—judge and constitute *and* track and follow and this means questioning Latour’s injunction ‘follow the actors’.

This agency redistributed to things not just makes them witnesses that help courts make judgements, but makes it possible for them to accuse, to become prosecuting attorneys.... And things constituted as *goods* can become the *bads* of the risk society.... During the ‘wanderings’ of quasi-subjects and quasi-objects through the networks, these topics or topos appear like a thousand plateaux, a set of mini-instances from which subjects and objects can select as competences—as added force—in disputes concerning their rights and the distribution of agency (Lash, 1999: 276).

This gives us social scientists tracking/judging objects and objects judging/tracking subjects. The question this poses is: who/what is following? Does it also include those not versed in social science or could this be another way into sociology’s dream of managing society through an elite of experts? Latour (1988, 1993) suggests that we should ‘follow the actors’ but this seems to provide Latour with a vantage point independent and detached from the actor-networks he depicts (see Shapin, 1998). Engeström et al. (2003; also Engestrom, 1987) explicitly acknowledge the connection between subject and object and argue that researchers should not only ‘follow the actors’ but ‘expand the object of activity’

by encountering the contradictions in activities so as to initiate new forms of understanding for subjects by constituting 'expanded objects'. For Engeström et al., (2003), Latour's benign objectivity and the tensions of simultaneously following *and* judging remain uninterrogated: is this objectivity and judging related somehow? Elam (1999: 2-3) similarly asks what is implied by an amodern constitution and what happens if 'we' go along with Latour is that he 'constructs himself as the master story-teller cultivating the power to captivate, while always escaping captivation himself. The question that follows is: can we believe in such an untouchable subject of knowledge'?

Elam (1999: 3) continues that because Latour suggests that he can see through our own modern constitution there are 'only a few privileged outsiders [who] are in a position to see or do anything'. Latour can follow and judge whilst most find of us find it difficult just to follow! In relation to this the non-modern constitution may mean symmetry for human and non-human actors but for Elam it presages asymmetries of the second great divide, that is, between the 'We' in '*We* have never been modern' and the pre-modern 'Them'. Elam argues that Latour suggests that as we become amodern with our 'impartial perspective' the non-Western world remains pre-modern and this legitimates newly configured asymmetries. Put another way, without an explicit articulation of the way in which there is recursive construction between researcher and researched, Latour's narratives are presented as if he is independent, detached and in a privileged position to judge.³⁷ Latour's response to the charges of objectivity, privileged judgement and distant engagement is Deleuzian in a number of respects. First, Latour posits a very particular version of realism, as do Deleuze

³⁷ From another tradition, Francis and Hester (2004: 185) argue that one of the significant differences between ethnographic practices associated with actor-network theory and ethnomethodology is that actor-network studies are not interested in detailed and close examination of how work gets done and avoid 'going native' or learning the practices of a particular community.

and Guattari (1994).³⁸ For Latour (1990: 71), an object's interests can be translated but this does not rule out resistance or betrayal by the object analysed symmetrically: thus 'a little bit of constructivism takes you far away from realism; a complete constructivism brings you back to it'. Second, for Latour no amount of reflexivity brings the immanent researcher closer to research data as outside social and historical contexts, and this 'red herring of empiricism' (remark attributed to Bruno Latour) resonates with Deleuze and Guattari's methodological imperative, which is to produce images of thought rather than unmask ideologies or posit concepts for contemplation. Third, Latour is interested in providing detailed empirical studies of the translations, purifications and deletions through which, for example, something comes to stand for 'data'. In a detailed empirical study Latour (1999) travels to the Amazon as a participant observer to scientists studying the border between the forest and the savannah. For each of the stages of research (e.g., research samples, thematic headings, interview pro-forma, etc.) Latour argues there is a chain of transformations in which some things are lost and some things are gained: in place of a meeting point between things in themselves and the human mind, data is a 'displaced achievement', a 'circulating reference' of reversible chains of transformation (Latour, 1999: 71). The field site is not, then, something that is left behind after the empirical research is completed but is displaced and transformed in written-up research:

³⁸ 'Deleuze rejects several of the entities taken for granted in ordinary forms of realism. To take the most obvious example, in some realist approaches the world is thought to be composed of fully formed objects whose identity is guaranteed by their possession of an *essence*, a core set of properties that defines what these objects are. Deleuze is *not* a realist about essences, or any other *transcendent* entity, so in his philosophy something else is needed to explain what gives objects their identity and what preserves this identity through time. Briefly, this something else is *dynamical processes*.... Thus, Deleuze's process ontology breaks with the essentialism that characterises naïve realism and, simultaneously, removes one of the main objections which non-realists make against the postulation of an autonomous reality. The extent to which he deprives non-realists from this easy way out depends, on the other hand, on the details of his account of how entities that populate reality are produced without the need for anything transcendent' (Delanda, 2002: 3, emphasis in original). Critical realism is also concerned with ontological issues, and although critical realism is not discussed in any detail in this thesis it is worth noting that the approach developed in this thesis is concerned with opening up ontological issues—that is, delineating new ways to approach how reality is constituted and the politics associated with this. Critical realism is, by contrast, is more concerned with ascertaining and circumscribing the ontological status of actors (see Fleetwood and Ackroyd, 2004).

What interests me now is the transformation undergone by the soil, now bound up in words. How to summarise this?... The philosophy of language makes it seem as if there exist two disjointed spheres separated by a unique and radical gap that must be reduced through the search for correspondence, for reference, between words and the world. While following the expedition to Boa Vista, I arrived at a quite different solution. Knowledge, it seems, does not reside in the face-to-face confrontation of a mind with an object, any more than reference designates a thing by means of a sentence verified by that thing... In order to understand the chain of transformation, and to grasp the dialectic of gain and loss that, as we have seen.... Stage by stage, we lost locality, particularity, materiality, multiplicity, and continuity such that, in the end, there was scarcely anything left but a few leaves of paper.... we have also gained or regained, since, with the same work of representation, we have been able to obtain much greater compatibility, standardisation, text, calculation, circulation, and relative universality, such that by the end, inside the field report, we hold not only all of Boa Vista (to which we can return), but also the explanation of its dynamic (Latour, 1999: 69-71).

The field site and the final written analysis are distinct but also ‘utterly linked through a chain of your own production’ (Massey, 2003: 83). There are, then, a series of small displacements between field site and written-up report which constitute long distance control but not action at a distance in the sense of control of two separate realms (see also Sismondo, 2004: 67; Cooper, 1992). Latour’s earlier injunction to ‘follow the actors’ can be kept so long as the researcher is understood as another actor—an actor who transforms, displaces, etc., and similarly is part of the ‘dialectic of gain and loss’ through the conduct of research. Undertaking research means translating materials and cutting the chains of heterogeneous networks, however temporarily, at particular points. Research output such as a doctorate thesis is, similarly, a productive expression of these immanent tensions, displacements and transformations.

Others have criticised Latour for an approach in which accounts of network construction and transformation take place without due regard to the wider social, historical and cultural context. Woolgar and Pawluch (1985) term the granting of a taken for granted context, as discussed in Chapter 2, ‘ontological gerrymandering’. Despite Woolgar and Pawluch’s concerns, Bloomfield (1995: 494), for example, takes up the concern with history and institutionalised power when he suggests that the challenge in describing networks and

translations between the symbolic, the discursive and non-discursive also requires that 'we must not lose sight of the fact that domination comes in many forms: in respect of issues of distribution we must include symbolic as well as physical resources, knowledge as well as opportunities for action'. Symbolic 'opportunities for action' would include, for example, enacting the context and taking cultural practices as another actor. Modernity's social and historical inheritance remains neglected in actor-network theory, according to Lash (1999), despite Latour's emphasis upon how contextualisation and decontextualisation takes place. Others such as Pickering (1984) and Shapin (1994) have criticised actor-network for not taking account of how existing cultural practices and allegiances frame what counts as rational decisions or new possibilities for action. Pickering (1984), for example, suggests that scientists are more likely to take up ideas and theories that build upon know-how they already use or can acquire relatively easily. Symmetrically, choices over appropriate know-how are related to ideas and theories at a particular time (see Sismondo, 2004).

Lash (1999: 283-4) analyses Latour's quasi-objects and quasi-subjects as a 'hermeneutics of return rather than retrieval' and argues that actor-network theory's account of temporality 'brings out the best and the worst in Latour's non-modernist futurology'. The best being its ability to follow the emerging 'global informational order' and the worst being that quasi-objects are counted as 'resources' for the future rather than having pasts to be retrieved from historically shared practices. This means, Lash concludes, that there is a forgetfulness of the past—of historically dominant images and assumptions or 'symbolic resources' in Bloomfield's terms—with actor-network theory and how culturally dominant understandings are constitutive of a particular worldview:

It seems to lead in the direction of instrumental rationality, in which quasi-objects and even quasi-subjects are primarily instruments. Thus 'collectives' 'mobilise' these competences and these quasi-objects as instruments furthering their own 'stability and expansion'.... We mobilise *technologies* in the interests of the expansion of increasingly global collectivities.... The assumptions here are clearly

of instrumental rationality and network functionalism (Lash, 1999: 284, emphasis in original).

Lash's (1999) point about the neglect of history in actor-network theory can be pursued through the argument that the historical time-scale for 'following actors' is most often framed by the period of the past that has to be traversed in order to demonstrate that a particular network effect could have been otherwise. Power and agency is indeed translated, delegated and passed between human and non-human actors and is tied to existing socio-technical networks yet description of these heterogeneous networks is usually delimited to a historical time-frame defined by the network effect (e.g., scientists' laboratory work or development of a technological device) being followed and this does constitute an analytical and empirical problem for studies using actor-network theory.

Foucault (1981, 1988) and Foucault and Deleuze (1977) also take up the implications of 'carrying about with her a shapeless bag of dingy, threadbare brocade', set out consequences of working with research data and take a particular approach to history. Foucault is similarly interested in the *how* of power, that is to say, the practices and techniques that constitute particular 'regimes of truth'. In this regard Foucault suggests that neat solutions to the relationship between research 'data' and 'researcher' is in itself part of the problem: for Foucault it is traditional concepts that propose a dualism between subjects and objects that need to be demonstrated as dangerous and rethought. Like Deleuze and Guattari's quote from Faulkner, in Foucault's terms, there is never a straight line of correspondence between the collection of research material, analysing data and writing-up research because of the productivity of power/knowledge.

A Foucauldian approach to problematising the neat solution between data and researcher is his genealogical approach. Miller and O'Leary (1987: 238) define genealogy as concerned with the historical conditions for the emergence of 'received notions' with the intention of

not only unmasking hidden relations but also teleological views and single points of history: 'the emergence of our contemporary beliefs is viewed rather by reference to a complex of dispersed events. Genealogy does not lead to solid foundations; rather, it fragments and disturbs what we might like to see as the basis for our current ideas and practices'. This means genealogical research can jump-start intervention in everyday practice from a different starting point than Whig interpretations that emphasise inevitable and functional progress but leave little room for 'jerky pictures' (Sismondo, 2004: 18):

It's true that certain people ... are not likely to find my advice or instructions in my books to tell them 'what is to be done'. But my project is precisely to bring it about that they 'no longer know what to do', so the acts, gestures, discourses that up until then had seemed to go without saying become problematic, difficult, dangerous (Foucault in Miller, 1993: 235, quoted in Flyvbjerg 1998: 224).

Contra the network functionalism and ahistorical approach that Lash attributes to Latour's work, Foucault saw himself as highly attuned to action and intervention and as a 'dealer in instruments, a recipe maker, an indicator of objectives, a cartographer, a sketcher of plans, a gunsmith' (Ezine, 1985: 14, quoted in Flyvbjerg, 1998: 225). Drawing upon insights from a genealogical approach at Hereford and Worcester Fire Brigade meant, for instance, analysing the conditions for technico-economic assumptions of the rationale and functional development of the VMDS (i.e., a response to the loss of two firefighters' lives, replacing out-dated paper records). Such research might not culminate in direct researcher-induced changes to organisational practices such as planned/expert organisational intervention. Nonetheless such research remains highly attuned to prefiguring change because the moment 'acts' and 'gestures' become 'problematic' and 'dangerous', structures of domination have the potential to be reworked into games of power (Hindess, 1996: 98-105). Latour's (1999) translations, Deleuze and Guattari's (1988) rhizomes, and Foucault's (1981) productivity of power/knowledge share, then, a concern with research as a practice of intervention by constructing and making visible new images of thought and ways of

acting. This means experimenting with rather than interpreting their ideas, pushing them to their limit, and working beyond them in ways not envisaged when beginning to conduct research.

5.6 Strengths and Limitations of the Research

The VMDS at Hereford and Worcester Fire Brigade has been associated, in the national and fire service media, with the first integrated mobile information and communication technology in the UK fire service. As is set out in the following chapters the novelty of the VMDS has to be carefully demarcated, and this means that a detailed exposition of the VMDS is an important part of this thesis. At the beginning of the research process, it was easy to be seduced into the innovative rhetoric of the VMDS particularly before beginning to conduct archival research. This focus on key actors such as the VMDS, and the neglect and marginalisation of other actors, is one of the common criticisms of the actor-network approach. In retrospect I think this tendency shadowed the fieldwork at Hereford and Worcester Fire Brigade, although in practice I attempted to remain sceptical of what I was told or given as I moved between the headquarters, stations and fire crews.

This research provides an ethnographically and theoretically driven analysis of the VMDS at Hereford and Worcester Fire Brigade. The implementation and development of the VMDS has been funded in large part by the Home Office because of its associations with best practice dissemination. A further empirical strength of this study is that research of this kind is highly unusual in the context of UK fire services. Social scientific research on fire services is also very sparse with a few notable exceptions (i.e., Salaman 1986; Weick, 1993; Hassard, 1993) and detailed studies of workplace practices relating to incident management information and communication technologies at the time the research was conducted were non-existent. This lack of a scholarly community presented an initial

difficulty in getting to grips with the fire service as there were very few accounts to provide an orientation to existing issues, preoccupations and practices.

Given that social scientific research into the fire services is under-developed, the level of cooperation and interest provided to me by Hereford and Worcester Fire Brigade was something of an ethnographic nirvana, although this is perhaps too verbose a way of expressing the access I was given. That said, the period of time spent observing workplace practice was short compared to the classical definition of ethnography as long-term immersion in the field. In addition, observation during the day shift was restricted because discussing, probing, etc., was delimited by various routine and collective crew activity. There were also significant limits to observations of incidents and this meant that I had to ask fire crews about incidents when they returned to the station. Station officers regularly offered to take me to incidents in their station cars, but this was declined as it constituted too much of a disruption to their working day.

I mentioned above that the role of the researcher is to establish a relationship between distinct but related contexts or 'little networks' in Latour's terms. I presented and discussed initial findings with senior officers from across the UK fire service at two annual fire service research events in 1997 and 1998. Notwithstanding this, more could have been made of this particularly in terms of returning to Hereford and Worcester Fire Brigade after the main fieldwork was conducted to discuss and refine emerging ideas and analyses. The research could also been strengthened by a more thoroughgoing first-hand engagement with actors outside of Hereford and Worcester Fire Brigade including the association for senior officers, regional and national employee representatives, the suppliers of the VMDS (Joyce-Loebl), and local and central government bodies.

Single and in-depth case studies such as this account of the VMDS at Hereford and Worcester Fire Brigade are often criticised for their lack of i) explicit theorising, ii) micro level analysis, and, iii) non-generalisable findings. The first charge cannot be adequately associated with research that is ‘empirical philosophy’ (Law, 2002), but it is important to respond to the other concerns. In addition to challenging a Whig account of technological change the research also provides an analysis of the VMDS as a constitutive part of the changing context of fire service provision in the UK: the more the research excavated the how, what, when and why of the VMDS the more it became understandable when situated as part of, and constitutively enacting, controversies over visions for the provision of fire services, boundary disputes between technological devices and organisational issues, rhetorics of hope and fear associated with the past, present and future, and translations of workplace practice. On the issue of context, Latour (1999) argues that the notion of ‘context’ is problematic as it sets up a relationship between levels of analysis, within which micro is understood as framed by the context. The concern for Latour is that a cultural/externalist form of analysis does not provide for the constitution of the context or new subjects and objects that are formed by a network of socio-material associations and practices—cultural analysis neglects the ontological activity that constitutes new senses of what is meant by a subject or object. Latour’s (1999: 133-37, emphasis added) approach, by contrast, is to analyse the extension across times and places of ‘little networks’:

A technological project is not in a context, it gives itself a context, or sometimes does not give itself one. What is required is ... *to study the way the project is contextualised and decontextualised*. To do that, the rigid, stuffy word ‘context’ has to be replaced by the supple, friendly work ‘network’. The big explanations in terms of politics, economics, organisation, and technology always turn up, without fail.... The people are missing; the work of contextualisation is missing. The context is not the spirit of the times which penetrates all things equally. Every context is comprised of individuals who do or do not decide to connect the fate of a project with the fate of the small and large ambitions they represent.

Flyvbjerg’s (2001: 25-49) response to the third criticism of non-generalisability is to foreground the way in which social sciences are qualitatively different in kind from natural

sciences because context and interpretation are the key criteria for social scientific forms of knowledge. This turn to situated understanding, which has gained considerable ground over the last two decades, is initially attractive although it is limited in analytical power because it leaves intact the idea that the natural sciences deal with *a priori* universal phenomena and do not need to be subjected to sociological inquiry (see Chapter 2, Section 2.6.2). In contrast to this a different approach to the issue of generalisability has been articulated since the 1970s by some sociologists of science and technology. Their concern is, as discussed in Chapter 2, *how* generalisability and universality are produced over times and places, that is to say, the way in which micro or local practices become universal facts or technological innovations: this means that universality is something to be studied and explained rather than assumed *a priori*. For those educated in the orthodoxies of social scientific theory and practice an approach that is interested in how effects are constructed through ‘contextualisation and decontextualisation’ is unlikely to be a satisfactory. Nonetheless the observation that universal facts or technological innovations have to be produced and sustained over times and places can be used to demonstrate the kinds of generalisation that are possible for social scientists. It provides a way into rethinking the ‘big’ social science preoccupations such as sociality, materiality, structure, power, interests, knowledge, and agency. It is, then, analytical generalisations on the working of these ‘big issues’ through the detailed exposition of particular empirical phenomena to which social scientists can make a significant contribution. This is attempted in the following three chapters on the VMDS, which focus, in turn, on the implementation, translation/multiplicity and ambivalent use of the VMDS.

Chapter 6: Ordering and Putting the VMDS in Place

'However modern we feel ourselves to be, I am sure that we are no more than half-way along the road, and in particular the issue of getting information to firefighters on the ground is still in its infancy. There is no doubt in my mind that for the future there will be an expectancy and requirement to make sure that all relevant information known to the organisation can be easily accessed by the operative at the sharp end who needs to act upon it'.

Trevor Bassett, 'Fire'.

'We first have to understand how it is that such a fundamental transformation of working practices and principles is made to appear necessary.... For it is from such a starting point that the search for a new reality becomes an imperative.... Before this can happen, the factory has to be problematised by diverse and heterogeneous groups of consultants, politicians, managers, experts, and commentators of various kinds, who pronounce on the deficiencies of existing ways of making things and call for new ways to be invented. The list of such agencies is in principle limitless and infinitely varied.... we do not know in advance who the agents are who will try to remake our world'.

Peter Miller and Ted O'Leary, 'The Factory as Laboratory'.

6.1 Introduction

On 20 March 1853 *The Sunday Times* reported on a fire at the royal residence at Windsor and part of the report read as follows: ‘A fire of very alarming and destructive character broke out at a late hour at Windsor castle.... Her Majesty displayed great coolness and presence of mind, and finding that firemen appeared to make some mistakes in carrying the hose gave orders to dispatch a “telegraphic message” to London for more firemen, who reached the spot by special train’ (Blackstone, 1957: 128). The quote from *A History of the British Fire Service* on Queen Victoria’s proficient use of the first electrical communication device presages contemporary associations: since the telegraph, technologies have been associated with affording possibilities for communicating information across ever greater distances, for enhancing the immediacy of information and for superseding inefficient or incompetent local practices.

The VMDS at Hereford and Worcester Fire Brigade is associated with defying distance and enhancing speed of communication to and between front-line fire crews in ways which resonate with the innovation of the telegraph some 150 years earlier (see Marvin, 1988). The purpose of this chapter is to examine how the VMDS comes to occupy this privileged position within Hereford and Worcester Fire Brigade. The argument set out in this chapter is that in order to understand the role the VMDS performs the actor-world that constitutes the conditions—the context and content—of its implementation has to be established. Throughout Hereford and Worcester Fire Brigade the introduction of the VMDS is described, almost without exception, in terms of two firefighter deaths at a large factory fire in 1993—the lack of the right information in the right place at the right time caused the loss of two firefighters’ lives and the VMDS was introduced to remedy this lack of front-line information for firefighters. In contrast to this largely accepted history, the argument developed in this chapter, drawing upon material from Chapters 2, 3 and 4, is that the

implementation of VMDS was not simply caused by the death of two firefighters, but rather the introduction of the VMDS is a relational effect that contextualises and decontextualises the loss of firefighters' lives in particular ways.

This chapter analyses the conditions for Hereford and Worcester Fire Brigade 'going technological' with the VMDS. How is the effect of 'technological deficiency' constituted and deployed? How is safety articulated for fire crews? How is a form of IT-centred ordering that emphasises working over time and place in new ways constructed as necessary, with what effects is it associated? What role does information play in the future delivery of fire services? In order to address these questions this chapter is structured into seven sections. The following section extends concepts introduced in Chapters 2 and 3 through a discussion of the non-essentialist relations between the discursive and non-discursive and suggests that this provides a basis for analysing how the VMDS is contextualised and decontextualised at Hereford and Worcester Fire Brigade. It is suggested that contextualising and decontextualising the VMDS is a way to approach the ontology of the virtual discussed in detail in Chapter 3. Section 6.3 describes the fire at the Sun Valley factory in 1993, the deaths of the two firefighters at the factory and the debate that ensued over the cause of the fatalities. This is followed by Section 6.4 which examines the distribution of retrospective accountability, authority and competency at Hereford and Worcester Fire Brigade. It is argued that the deaths of the firefighters was translated, firstly, into the brigade's failure to provide sufficient information to fire crews at incidents, and, secondly, into a technological failure to provide information to fire crews at the right time. From this it is suggested that the VMDS is up bound with a general problematic of ordering fire service provision, and that this problematic of ordering is analytically important because it denotes the way the VMDS is a collective 'hook' (Lee, 2001: xiv) for Hereford

and Worcester Fire Brigade to articulate to its role and to envision the future provision of fire services around information.

Section 6.5 continues points made in Section 6.4 through an examination of the concept of disenrollment and an exposition of the way in which inconsistencies are worked out through the deployment of different rhetorics in different contexts. Section 6.6 comprises of an explicit focus on non-discursive practices and argues that the implementation of the VMDS cannot be separated from previous paper-based practices. It is argued that the connection between previous practices and the VMDS marks out the way in which information is characterised by relations of presence and absence, and this is illustrated through the deaths of two firefighters at an incident in the mid-1970s. Section 6.7 discusses the relationship between the universal access afforded by the VMDS, the centralisation and formalisation of informational practices set up by a newly formed Operational Intelligence Unit, and the issue of standardisation in fire brigades. It is suggested that, in the context of potential regionalisation of fire service provision, the VMDS is bound up with attempts to reproduce the power of brigade-centred practices by demarcating the prospective boundaries of Hereford and Worcester Fire Brigade's autonomy and authority. The VMDS is a new actor at Hereford and Worcester Fire Brigade that is accepted by fire crews because the form of standardisation it constitutes is aligned with existing structures, practices and assumptions of the provision of fire services. The final section of the chapter is concerned with making some concluding remarks.

6.2 Assemblages Comprised of Discursive and Non-Discursive Effects

Drawing on actor-network theory, Brown et al. (2001) set out the way in which discursive (e.g., written reports, texts generally) and non-discursive (e.g., tools, techniques and skills) relations are non-essentialist, contingent effects or accomplishments that are the limit and

support of each other.³⁹ Chapter 3 outlined an approach to the evaluation of phenomena that examines how relational effects become *causes*, often taken for granted ones. This delineation of effects into discursive and non-discursive is useful in analysing the VMDS as it provides an approach to understanding technological objects without reverting to what Sismondo (1996) terms ‘neo-Kantian’ social determinism or mundane forms of technological determinism.⁴⁰ There is not, then, an opposition between ‘words and things, nor between discourse and materiality. It is rather between two kinds of mixed ensembles... or ‘multiplicities’.... Taken together, the multiplicities form an unstable but nonetheless coherent, whole’ (Brown, 2001: 179-80). Thus what is required is analysis of these non-essentialist discursive and non-discursive effects that account for the shaping of technology *and* what is shaped by technology. Star and Bowker (1999: 6) provide a similar notion of the non-discursive in terms of infrastructure which they define as large-scale technical procedures and practices. The approach that Brown et al. (2001) adopt is also connected in large part to Latour’s super-symmetrical rule of method, which treats the capacities of

³⁹ ‘Non-discursive’ rather than ‘materiality’ because language also has material effects (see Brown, 2001). Discourse has material effects but can also become ‘non-discursive’ when translated into a technological artefact. Similarly Foucault, who is often charged with positing the primacy of discourse, wants discursive statements to be understood in terms of a ‘repeatable materiality’ but he also wants the ‘thick tissue of non-discursive relations’ that composes the ‘background of intelligibility for those actually speaking’ to be accounted for (Dreyfus and Rabinow, 1982: 58, quoted in Brown et al., 1998). Deleuze and Guattari (1988) use the terms ‘forms of content’ and ‘forms of expression’ to denote the non-discursive and the discursive (see Chapter 2, Section 2.9).

⁴⁰ Brown (2001: 176) writes that there is something ‘deeply unsatisfying about a narrowly discursive reading’ because what happens after once we have learnt that X or Y is a ‘human kind, and that, like all social constructions, it is negotiated into being within discourse’. It is not enough, Brown continues, because it moves us away from activities and practices: a focus on the social relations that ‘work up’ technological impacts has substantial difficulty in analysing the ways in which social relations are increasingly mediated by technological devices. The most analytically productive approach to the relationship between the discursive and the non-discursive, that is, one that does not fall into *a priori* essentialism, is where the relation between the discursive and non-discursive is understood as the limit and support of the other and this means that there ‘is not found in the opposition of words and things, nor between discourse and materiality. It is rather between two kinds of mixed ensembles of variable elements, or “multiplicities”.... Each [multiplicity] is assembled according to its own particular rules of formulation. Texts are formed with reference to local grammar and conditions of intelligibility. Figures [on canvas] are drawn out by way of local conventions around composition and “good form”. Taken together, the multiplicities form an unstable, but nonetheless coherent, whole.... Yet this non-discursive [multiplicity] on which discourse depends is not raw material that is simply “just there”, but is instead a series of elements that have been arranged and composed in a manner no less rigorous than discursive statements. [This] breaks up the assumption that it is language that predominantly expresses human agency and power. Discourse is not applied to a pre-formed world, like paint daubed across a canvas, but is rather one aspect of an active process of composition where discursive and non-discursive elements are arranged together’ (Brown, 2001: 179-80).

subjects and objects as relational effects that are different in degree rather than different in kind, and to Law's (1987: 111) 'heterogeneous engineering' which argues that technological change is an irreducibly political process comprised of three types of actor: devices, documents and people.⁴¹ Heterogeneous engineering involves constituting an actor-world that provides the conditions for adopting a particular actor, whether that is an innovative technical device or new set of skills. This means that 'successful' technologies are those that have enrolled, aligned and stabilised devices, documents and people across times and spaces (see also, Callon, 1986; Latour, 1986, 1993, 1999; Law, 1987, 2002). Latour (1988) describes the following of mobilisations, transformations and delegations in terms of 'infra-language'. This infra-language follows the way in which effects, which are comprised of quasi-objects and quasi-subjects, become taken for granted causes. For Latour (1988: 162) effects are 'constructed from trials of responsibility' and this means that 'a cause (factor, determinant, pattern or correlate) is the outcome of a trial of responsibility through which a few elements of the network are taken to be the impetus behind the whole business. It is, in practice, very much an election of representatives or, depending upon the outcome, an accusation made against a scapegoat'.

Indeterminate and contingently stabilised discursive and non-discursive effects presage the ontology of the virtual set out in Chapter 3 (see in particular Section 3.5 and 3.6). It was suggested in Chapter 3 that there are two parts to the ontology of the virtual: the first, which is the primary concern of this chapter, is described as determination or problematisation—this is termed 'ideas, problems and structures' by Deleuze (1994).⁴² This is the construction

⁴¹ The affective interdependency of discursive and non-discursive effects constitutes an approach to knowing which Brown et al. (1998) describe as 'epistemological realism', and an approach to ontology which is relativist. Knowing is premised on ontological work that constitutes, deletes, excludes and transforms such that knowledge appears 'ready formed'. This 'weak' version of epistemology assumes that the de-fault mode of going about everyday activity is one in which the irremediably incomplete and contingent basis of knowing is suspended.

⁴² An orientation to the etymological roots of the word 'virtual' provides a way into a reanimated conception of the virtual. The *Oxford Dictionary of English Etymology* traces the word virtual from the Medieval Latin

or differentiation of discursive and non-discursive relations into a particular problematisation. Latour's version of Deleuze's differentiation is the concept of the variable ontologies of entities in which stabilisation or determination of an effect is contextualised and decontextualised in ways which range from event to essence (see also Chapter 2, Section 2.8.1 for more detail on Latour's variable ontology). The second part of the ontology of the virtual, which is the focus of Chapter 7, comprises of the transformations that occur with the actualisation of a problematisation (that is, ideas, problems or structures) in particular socio-technico-historical contexts in which the differentiated, problematised or determinate effect is differentiated: an effect 'must see its own identity swallowed up in difference' (Deleuze, 1994: 56) through transformations which appropriate, ignore, disconnect, subvert, dovetail or supplement.

Because the two-part movement of the ontology of the virtual never reaches a final resolution, the task of articulating differentiation (i.e., making something determinate) and differentiation (i.e., making something different) is the critical and creative activity for those researching organisations. Following different/ciations is what I term an 'ontological

virtuālis to the old French *virtū* and the Latin *virtūs*. The root of virtue comes from *vir*, or man, a man who acts with valour and courage, and conveys the notion of virtue waiting to be exercised:

Virtue †power, influence; efficacy, conformity to moral principles; excellence XIII; (arch.) high merit or accomplishment XIV ... f. *vir* man (see VIRILE). So virtual †effective XIV; that is so in essence or effect XVII (whence virtually XV).

The semantic overlap of virtue and virtual becomes evident with the etymological roots, but what exactly is the relationship between the two? *Virtue*, as illustrated by its etymology, has three principal senses: it denotes power, worth and affect. The first sense, virtue as the power of things, resonates with phrases such as 'by the virtue of' which denotes 'through the power of', yet does not, in a commonly understood sense, convey any kind of moral quality. The first two senses can be linked if virtue can be thought of as the intrinsic power of an entity which when actualised affirms a valued and moral quality. The etymology of *virtual*, however, contains little connotation to moral quality. As the word is increasingly used, to be 'virtually safe' designates something that should not be trusted or valued. In contemporary usage the word virtual is becoming synonymous with morally neutral techno-scientific fields such as computing and information science. For example, the current edition of the *Shorter Oxford English Dictionary* defines virtual in relation to computing as: 'Not physically existing but made by software to appear to do so from the point of view of the programme or the user'. This almost real, or apparently real, but still not quite real, is at the centre of contemporary associations of the virtual. With this shift in usage, it becomes increasingly difficult to conceive of techno-scientific objects such as computers as actors that are related to issues of power and worth. The third sense of virtue as affect, in which affect means to be 'effectuated' or induced into movement by others (see Latour, 2004), denotes the way in which affects are problematised and become effects. This resonates with the first sense of the ontology of the virtual discussed in this chapter although this usage is far from commonplace.

turn' in organisational analysis (see Brigham 2001; Burrell, 2003: 528). Brown et al. (1998: 87) similarly conclude with a two-fold commitment that resonates with this two-part ontology of the virtual: firstly, 'to hear what is spoken (but also to see what becomes visible) while refusing to "name" or otherwise en-frame what speaks in terms beyond those afforded by local contingency, by concrete specificities', and, secondly, to 'participate in the becoming of the real, in its precipitation as well as its mapping'.

6.3 A Genealogy of the VMDS, Sun Valley and the Problem of Order

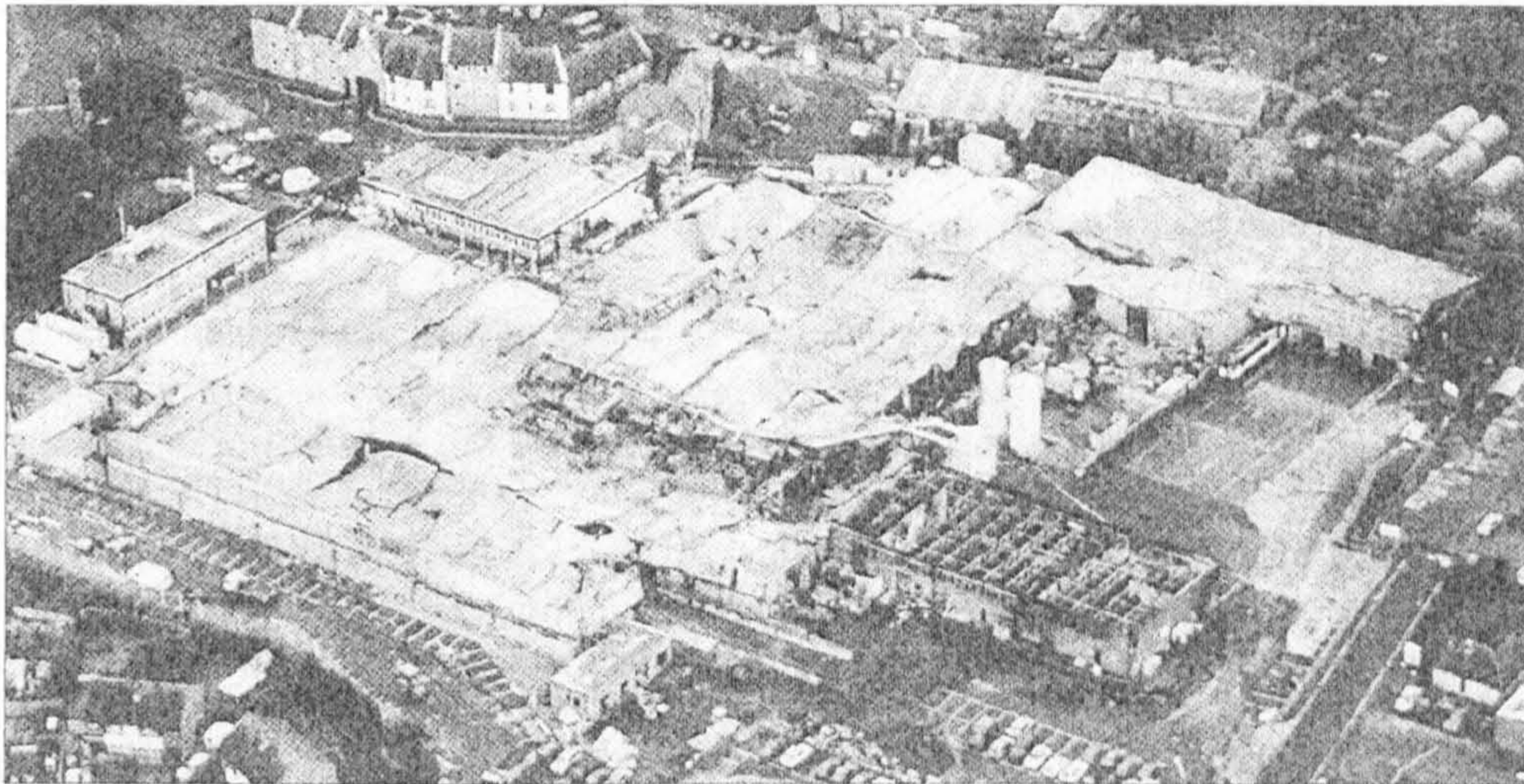
On 6 September 1993 two of Hereford and Worcester Fire Brigade's firefighters died at a major fire incident at a large poultry processing factory called Sun Valley. This incident was a major event at Hereford and Worcester Fire Brigade with over 20 fire appliances from across the brigade attending the factory fire.⁴³ Diagram 6.3.1 depicts the Sun Valley factory with its collapsed roof which it is assumed led to the deaths of firefighter John Davies, a retained firefighter based at Leominster, and firefighter David Morris, a wholetime firefighter with 11 years' experience based at Hereford. Two deaths at one incident is rare within the fire service with 13 fatalities across all fire services between 1990 and 2000 (see also Chapter 4). Two firefighter deaths at one incident is, then, not only a tragedy, but is a nationally reported media incident that opens up questions relating to the causation of the fatalities, the degree of individual and collective responsibility, and senior management competency.

The fire at the Sun Valley factory initiated a significant controversy within the UK fire service in relation to the use of sandwich panels in industrial food processing. Sandwich panels were understood to be the primary cause of the collapsed factory roof because their strength is drastically compromised by heat. These panels were therefore of great concern

⁴³ Hereford and Worcester Fire Brigade had attended sandwich panel related incidents before Sun Valley. Two days before the Sun Valley fire there was an incident with 'smouldering panels' at another meat processing factory in Abergavenney (Morgan and Shipp, 1999: 41).

amongst the UK fire service community: they were, for example, one of the major themes for plenary discussion at the Fire '97 Conference and Exhibition in Bournemouth some four years after the Sun Valley fire. With regard to the conference's theme on discussing sandwich panels, Tucker (1997: 17) wrote that these 'panels themselves put firefighters at substantial risk from structural failure, often with catastrophic results. It is extremely difficult to predict the path of fire spread through voids, particularly when large sandwich panels are used' (see also Tucker, 1997a).

Plate 6.3.1: Aerial view of the Sun Valley poultry factory, September 1993 (Source: 'Fire: The Journal of the Fire Protection Association', 1996: 13).



Similarly, in a report written by Hough (1996), following a seminar a year earlier, in March 1996, which was attended by the food processing industry, insurers and the fire service, including the Chief Fire Officer of Hereford and Worcester Fire Brigade, Hough (1996: 13-14) wrote:

The industrialisation of the food processing industry has seen a corresponding increase in the number of serious fires in recent years.... The Sun Valley Poultry Plant in Hereford, where two firefighters lost their lives, the February 1995 meat processing factory near Falmouth in Cornwall, and the Yorkshire pudding manufacturer in Hull, July 1995, being just a few examples.... Fire risks are inherent in the food industry [frying, baking, etc.,] ... The large buildings in which these processes take place cannot be forgotten.... Compartments have to be built to house different production lines, which change frequently according to seasonal and consumer demand. Insulating sandwich panels are used for these compartments

[and] the large voids above these panelled compartments contribute significantly to fire spread and eventual ceiling collapse.

Hough's report of the seminar argues that fire safety must be contextualised within the wider institutional framework of building regulations and practices, that is to say, the use of particular materials and construction practices and norms, along with a concern for economic development, and industrial and urban development policies. Tucker (1997: 21-2) writes that a further food factory fire in June 1997 in Aylesbury, which had similar characteristics to the fire at Sun Valley, continued the controversy over uncomparted and unsprinklered buildings constructed using sandwich panels: 'extensive use was made of polystyrene panels which covered the entire premises, with the exception of the offices and the packaging store.... At design stage, automatic sprinklers were recommended by Buckingham Fire and Rescue Service, due to the size of the uncomparted production areas, but were not installed'. The issue of specifying safety standards through building regulations was also made at the seminar by Hereford and Worcester Fire Brigade's Chief Fire Officer, who said in regard to sandwich panels and fire safety more generally: 'We have to accept that fires happen. We need built-in fire safe systems, especially ventilation. Then we are in with a chance.... My aim is only ever to deal with small fires' (quoted in Hough, 1996: 13). The Fire Brigades' Union (FBU) also expressed concern with the risks to its members associated with 'fire performance' of sandwich panels:

The FBU views the fire performance of some types of large insulated sandwich panels with extreme caution.... The FBU has called for a large-scale testing programme to be implemented jointly by the Home Office and the Department of Environment, Transport and the Regions.... We believe that until scientific research is conducted and the fire performance evidence from that research is analysed, regulators and enforcers cannot develop the appropriate fire safety strategies to determine the safe use of all types of insulated sandwich panels in the construction of buildings.... we remain extremely concerned over the slippage of time on this matter. Given that insulated sandwich panels are now extensively used in the construction of buildings, some of which are used for public access purposes, we need to see some action by the Government on this issue quickly (Evans, 1997: 17).

The emphasis on understanding the risks to firefighters associated with sandwich panels is connected to contemporary architectural designs for factories, regulatory standards for sprinkler systems and the need for immediate research on the fire performance of sandwich panels. Since the Sun Valley fire there has, however, been an increasing association with the provision of information and communication technologies to front-line firefighters, watch commanders and station officers at incidents to improve workplace health and safety, and operational effectiveness. This investment is demonstrated, for example, by fire brigades across the UK implementing VMDS technologies. Yet the investment in this form of front-line technology is a recent phenomenon in UK fire services. It was suggested in Chapter 4 that compared to other emergency services there has been an under-investment in IT throughout the 1990s and that major reviews of fire services had been marginally concerned with the role of information and communication technology in modernising fire service provision. The Audit Commission's 1995 review 'In the Line of Fire', for example, discussed IT in terms of back-room support and command and control rooms, but only in a few paragraphs. There is, then, little evidence from major national reviews of high-level strategic thinking or an ongoing institutionalised approach to the deployment of advanced information and communication technologies. Additionally, IT solutions do not form a significant part of the various forums in which Sun Valley was discussed including multi-agency seminars and trade union reports. How, then, does the VMDS come to play an important role in ensuring that incidents such as Sun Valley do not occur again?

6.4 Loss of Life, Information Failure and the Deployment of the VMDS

In response to the Sun Valley fire, and after an investigation into the deaths of the two firefighters, two Health and Safety Improvement Notices were served on Hereford and Worcester Fire Brigade in May 1994—one for breathing apparatus procedures and the other

for inadequate provision of information. The latter stated that Hereford and Worcester Fire Brigade was in contravention of the Health and Safety at Work Act (1992) because

the information held by the Brigade and available to fire crews and officers on particular hazards associated with the design and materials of construction of buildings is insufficient to ensure as far as reasonably practicable the health and safety of firefighters ('The Grapevine', Hereford and Worcester Fire Brigade, Summer, 1997: 8, emphasis added).

The basis for the latter Improvement Notice was the statutory requirement that obliges all fire services to provide information and instructions to firefighters about significant risks they may encounter while attending an incident. The Fire Services Act 1947 section 1.(1).D states that it is a statutory duty for fire brigades to inspect buildings and to keep records of these inspections:

Efficient arrangements for obtaining by inspection or otherwise, information required for firefighting purposes with respect to the character of buildings and other property in the area of the Fire Authority, the available water supplies and the means to access thereto, and other material local circumstances.

At the time of the Sun Valley fire, Hereford and Worcester Fire Brigade's practice, which was common across all UK fire brigades, was to hold a series of paper-based risk cards held in A4 folders which were kept in the cabins of fire appliances. These risk cards are often known as 1.(1).D risk cards or '084s' (see Plates 1-5, Appendix 4 for examples of pre-084 and 1.(1).D risk cards). Holding a rudimentary form of information had been required by statute since the end of the Second World War but had intensified in the mid-1970s after an external report on information held by brigades:

In 1974 a consultative report produced for the Fire Service nationally by Software Sciences entitled 'The information needs of firemen attending fires' was published and contained many recommendations which resulted in the brigade providing each fire appliance with a file containing information including water maps, hydrant records, building plans, special risk procedures, and information on hazardous substances. These files have now become so large it is becoming impossible to maintain and update them in an effective manner (Command, Control, Mobilising and Management Information System, 1989: unaccredited and page number unavailable).

Until the VMDS was implemented, risk information for front-line firefighters was produced by each station in the form of 1.(1).D records (often by one or two people who were interested in the task) and was specific to a station's turn out area. 1.(1).D records of major risks were however distributed to neighbouring stations and a spare copy of all the risk cards for a particular station were kept in a designated box at each station. Notwithstanding these practices, the Improvement Notice that was served on Hereford and Worcester Fire Brigade was contextualised as the result of a two-fold failure of existing practices at the brigade. The first general failure was not to have taken advantage of the benefits of information and communication technologies for firefighting: fire services lagged behind comparable organisations (e.g., the police service) that had introduced new IT-mediated ways of working across space and time. The second, and related, information failure was that paper-based 1.(1).D risk records did not provide quick and mobile access to information to all fire crews. This compromised firefighters' health and safety.

In response to the Improvement Notice, the newly formed Operational Intelligence Unit concluded that there were considerable constraints with the existing paper-based system. These problems with the system of A4 folders included the spatial dislocation of over 35 folders and the physical problem of storage of the paper records within the folders; the temporal problems of accessing risk information before arriving at an incident, especially for fire crews attending incidents outside of usual turn out boundaries for which they might not carry a 1.(1).D record; the doubtful accuracy of station-based 1.(1).D records with the responsibility for updating conventionally allocated to a firefighter(s) who was interested in the task; the difficulties of auditing and documenting the rationale for including or excluding information; and, the time and cost of updating information that was paper-based (see 'The Grapevine', Hereford and Worcester Fire Brigade, Summer, 1997: 8). The failures of the paper-based 1.(1).D records described above illustrate what Gherardi and

Nicolini (2000) describe as the traditional approach to industrial disasters and accidents at work (Gherardi and Nicolini, 2002). This approach considers safety to be 'a property of technical systems that is objectified in "safe" technologies and artefacts.... This is supported by the normative route that views safety as the outcome of the application of rules and regulations that prescribe "safe" individual and collective behaviours' (Gherardi and Nicolini, 2000: 7).

The Operational Intelligence Unit's conclusions of the lack of mobility, immutability and combinability (Latour, 1987) of existing technical practices were important in the decision to introduce the VMDS. Yet prior to this, a new disciplinary problematisation of fire service provision had to be visible at least in part. Bloomfield and Coombs (1992) term this a disciplinary dimension or discursive vision that, in this instance, is bound up with what is meant by organisation. This disciplinary vision denotes the importance of what ICTs mean for how collectives symbolically articulate and materially distribute their roles. Information and communication technologies are, in other words, bound up with the discursive constitution of ways of classifying, ordering and constituting organisational reality 'against a backdrop of professional and other knowledges, and associated ways of thinking and speaking' (Bloomfield and Coombs, 1992: 467). This disciplinary dimension to understanding information technologies is significant because it marks out the setting up of boundaries from which actions become thinkable and speakable, whilst simultaneously constructing a space for action.

The Chief Fire Officer's comments on the conclusion by the Principal Health and Safety investigator into the two firefighters' deaths at Sun Valley provides an example of the disciplinary vision of particular presencing practices (for more detail on presencing practices see Brown et al., 1998). In this section from an article in a specialist fire news magazine the Chief Fire Officer quotes the report in order to argue that coordination and

accountability post-Sun Valley necessitates the provision of better information and that the inspector

was surprised that a fifth and subsequent appliances which arrived at the scene did not have information that was required to ensure crews' safety and that because of this the Officer in Charge was "fighting the fire with one hand tied behind his back".... *the Officer in Charge cannot issue instructions or supervise employees without information* (O'Dywer, 1996: 33, emphasis added).

This is an interesting passage on several dimensions. It suggests an attempt to signify that information is *the* problematic for maintaining organisational order. But, importantly, this section of the article translates and abbreviates the lack of sufficient information into lack of information to the right people. The initial reason for a Health and Safety investigation—what caused the loss of life—is rendered into a narrative (termed 'narrative infrastructure' by Deuten and Rip, 2000) of information management. In other words, a shift from the aggregation of risk narratives as linked to more or less tightly coupled systems to risk as potentially extraneous to firefighters' work through expert decision making with the provision of VMDS information. As such, the Chief Fire Officer's article is bound up in the construction of an obligatory passage point through which future decisions, which come to centre on the implementation of the VMDS, have to pass. These obligatory passage points are constructed through what Latour (1987) terms 'inscription devices'—abbreviated versions of reality which can take the form of reports, articles, records, maps, diagrams, tables, and so on (see Bloomfield, 1991). Henceforth, then, the preoccupation with information, and in particular on technologically mediated information, marks out the beginning of a new disciplinary space of information management at Hereford and Worcester Fire Brigade.

The view of the need for more reliable information management is taken from the conclusion of the Health and Safety investigation that it was only the 'fifth and subsequent appliances' that did not have information on the sandwich panels at Sun Valley. By

implication this information was available to the fire crews that arrived before the fifth fire appliance—the problem was not a lack of information, but getting the information to the right place at the right time. This meant that Hereford and Worcester Fire Brigade's fire crews were, according to the report, not properly equipped to attend incidents such as Sun Valley because not all crews had access to the same information. The 'fire performance' effects of sandwich panels were not however widely disseminated across UK fire services with this knowledge more or less competently assessed against the particular construction of the Sun Valley factory. This means that even if all fire appliances that attended the fire had held risk information for Sun Valley these records would not have contained detailed information on the fire performance of sandwich panels.⁴⁴ This is not to suggest that the 'real interests' (Lukes, 1974) of firefighters in amending the building sector's practices have been masked or the real cause of the fire has been distorted (Habermas, 1983) by the Chief Fire Officer's article and subsequent decision to introduce the VMDS, but rather that the differentiated effect or disciplinary vision of incident management centred around information makes available only one particular way of approaching the question of how to provide fire services after Sun Valley.

The focus on information is an attempted problematisation of the loss of two firefighters' lives into the failure of the technological capability to provide information to all attending fire crews at major incidents rather than a problematisation around, for example, building regulations that emphasise a voluntaristic approach to levels of fire safety above specified minimums. But as mentioned above, this turn to the power of information should not however be understood as simply the duping of firefighters at Hereford and Worcester Fire Brigade. It denotes a discursive space in which the attribution of problematics to

⁴⁴ Fire crews often told me that sandwich panel fires had occurred before Sun Valley and that there was knowledge of the fire effects of sandwich panels particularly in the USA and Germany. Morgan and Shipp (1999: 41-44) detail fires with sandwich panels including a fire at a poultry factory in North Carolina in September 1991 at which there were 26 deaths and 54 injuries.

technical/information, organisational, managerial or regulatory failures is flexible and subject to translation by various actors (see, for example, Bloomfield and Daneli, 1995). In addition to this, the turn to information—to the problematisation of dangerous incidents as manageable through information—can also be related to the symbolic ‘new era’ function of information in contemporary organisations during the 1990s and to the particularities of fire service provision over the last two decades.

6.5 Disenrollment Through Invisibility and Dual Rhetorics

This focus on information is premised in part on the assumption that information provides ‘greater control over the material and social world through enhanced clarity, transparency and visual certainty at a distance’ (Cooper, 1997: 33) at a time when Hereford and Worcester Fire Brigade had to demonstrate that it was discharging its responsibility to provide fire crews with a safe working environment against changes to the type of risks that fire crews encounter. The VMDS offers a potent example of an inscription device that is mobile, immutable and combinable (see also Bloomfield, 1991), and emphasising the role of information is, then, a way in which some of the external pressures that Hereford and Worcester Fire Brigade faces can be partially reworked by configuring brigade competency and accountability into formal procedures for managing information. This resolution has other effects at Hereford and Worcester Fire Brigade which resonate with the context of fire service provision set out in Chapter 4. First, the preoccupation with information does not demand significant organisational restructuring at Hereford and Worcester Fire Brigade. Instead it requires a particular technical configuration in conjunction with formalised management procedures to process, record and update information. Second, the introduction of the VMDS does not require significant investment in new personnel or further training of existing fire crews.

Despite this new emphasis on the power of information the provision of information on firefighter deaths remained differentially available at Hereford and Worcester Fire Brigade particularly for those who are not from the deceased firefighters' watches/stations. Hereford and Worcester Fire Brigade's reports into the factory fire, which were difficult to access within the brigade, constitute an invisible intermediary that relied upon other intermediaries. As a sub-officer at Bromsgrove station described there has never been a brigade-wide debriefing on what happened at Sun Valley:

Researcher: Has there been any sort of, you know, Brigade-wide debriefing on what happened at that event?

Sub-officer: No and I'll tell you, well ... The facts of it I'll say this to you, you won't get this opinion from anywhere else but I was the FBU rep at Sun Valley not—but by accident—I was in charge of one of those appliances that went to Sun Valley I got Sun Valley and the Chief Fire Officer shouted—I turned up [...] then I went with the FBU the next day ... and the union and the brigade met then we had a real you know there was Health and Safety law all sorts of things, they didn't have a debrief for Sun Valley for a believe legal reasons because the case hasn't come to court.

Researcher: Who's taking who to court then?

Sub-officer: The widows of the firefighters with the FBU lawyers are taking legal action against Hereford and Worcester Fire Brigade against Sun Valley Poultry and litigation, damages claims or what have you. There have not to my knowledge been proper debriefs I think that's it, to find out what bloody happened at Sun Valley.

Researcher: I was going to say is this shared amongst the brigade well this is what happened and why?

Sub-officer: No I don't think so, I think there's a feeling of what happened across the brigade, rumour as such, I am not sure there has been specific—there have been debriefs of a type if you know what I mean, nobody has ever drawn a map of Sun Valley and said two firefighters went in there so and so went in there.

The lack of an official internal debriefing and the invisibility of official investigations and reports, but simultaneous deployment of particular extracts of the Health and safety Improvement Notice in the brigade's internal channels of communication which emphasise the role of enhanced technologically mediated information, is bound up with further simplified intermediary that constructs the loss of lives as thinkable and speakable in terms of an information and communication failure. This is a further instance of the disciplinary

dimension or discursive space of information and communication technologies which is constitutive of the shaping of 'the form and content of the project' before a 'move back to the world' (Bloomfield and Vurdubakis, 1997: 86, 104) in the form of the VMDS installed on fire appliances.

The invisibility of formal representations in relation to the Sun Valley incident can be contrasted with the visibility of the debate within the fire service community on sandwich panels. Although there had been significant debate and a number of formal reports produced, both across and beyond the UK fire service community, about the effects of sandwich panels, discussion of sandwich panels within Hereford and Worcester Fire Brigade, at the time the research was conducted, usually occurred during 'off the record' interviews and informal conversations with fire crews. In contrast to the debate on sandwich panels external to Hereford and Worcester Fire Brigade, few internal documents dealt with the fire performance effects of sandwich panels without discussing the VMDS. From these observations a dual rhetoric can be delineated in relation to how the VMDS is mobilised (or not) in particular circumstances (see Pinch et al., 1992). First, a weaker rhetoric outside Hereford and Worcester Fire Brigade in relation to the impact of the VMDS on front-line fire incident management. The focus of this rhetoric was centred upon external consumption with an emphasis on building regulations and fire crews' practices: there is awareness of the broader social, political and regulatory contexts of incidents such as Sun Valley and the extended time frame of improvements to fire crew safety. Second, a stronger rhetoric, which was largely internally focused on fire crews' practices, that set out the promise of radical change to the way fire crews approach incidents brought about by the VMDS.

The introduction of the VMDS can be understood in part as constituted through particular conjunctions and separations of these weak and strong rhetorics, with the weak rhetoric

deployed, in large part, in contexts external to Hereford and Worcester Fire Brigade and the strong rhetoric emphasised internally. At Hereford and Worcester Fire Brigade it is, for example, only during informal interviews and discussions that the dual rhetorics are brought into opposition with each other and the role of the VMDS problematised and contradictions of its implementation elaborated. In these informal exchanges, firefighters regularly describe, for instance, how modern industrial plants, warehouses and supermarkets are very dangerous to fire crews because they often are not fitted with automatic sprinkler systems and are designed not to be recoverable in the event of a significant fire. Despite this fire crews would have to try and enter a burning building if it was thought the building was still occupied. The effect of the strong internal rhetoric of internal representations is that loss of lives at Hereford and Worcester Fire Brigade becomes resolved (albeit contingently so) around the notion of 'technical information failure' and the potential 'power of information'. From this, the decision between options becomes demarcated within technologically mediated choices such as mobile faxes or communications from a centralised database.

There are, however, also temporal and spatial dimensions to the deployment of particular rhetorics (see also Chapter 8). The introduction of the VMDS can be understood as the response of a relatively weak brigade (particularly vis-à-vis other fire brigades) to external pressures to reform its incident management practices. However, the comparative standing of the brigade may become something quite different once VMDS-type technologies are adopted by other brigades and mobile data devices become institutionally established across other UK fire services. For instance, the following is taken from promotional material from the technology supplier which provided the VMDS to Hereford and Worcester Fire Brigade:

The Joyce-Loebl VMDS has met the remit of the Health and Safety Executive in a practical and cost effective way; improving response times, making information more accessible on screen and in hard copy. It can be accessed and shared among the fire fighting team.... the VMDS is making a difficult job less stressful by not leaving decisions to chance (credited to Hereford and Worcester Fire Brigade, 'Delivering data on time ... en route ... at the scene', Joyce-Loebl VMDS brochure, undated).

In this quote from the company that supplied the VMDS but which is attributed to Hereford and Worcester Fire Brigade, the target of the strong rhetoric of radical change induced by the VMDS is not so much internal fire crews but those external to Hereford and Worcester Fire Brigade, such as other fire brigades—issues which are discussed in more detail in Section 6.7 below and in Chapter 8.

6.6 Previous Practices, Near Misses and Deaths in 1974

The previous section set out the ways in which the loss of two firefighters' lives is discursively constructed as a technological failure of information management and argued that there are two rhetorics that can be associated with the VMDS which are deployed differently in particular contexts. Different rhetorics emphasise what Law (2002) terms ontological politics—a politics which brings together different realities in jerky relation with each but which is often marginalised when there are controversies.

In addition to the points made in the previous section, 'technical information failure' is also comprised of a non-discursive dimension. The paper-based A4 folders that were held on each fire appliance are non-discursive effects which are interdependent with the discursive construction of information failure set out above. The role of the previous paper-based technology of folders is, then, bound up with the presupposition of a solution based upon new information and communication technology, although not in a deterministic way. Rather, the A4 risk folders, used since the mid-1970s with written, typed and diagrammatic

risk information, support and provide a limit for a particular discursive space for future information provision to the fire crews.

The failure to enrol other actors (in this case, non-discursive actors) in explaining the loss of firefighters at Sun Valley beyond 'technical information failure' can be illustrated through another tragedy nearly two decades before the Sun Valley fire. The deaths of two other firefighters in the mid-1970s illustrates the way in which the discursive constitution of information failure depends at least in part on non-discursive practices through which information was maintained, shared and consulted before the VMDS: in other words, the failure of paper-based technology (i.e., A4 folders) became a condition for the introduction of VMDS because there were few other non-discursive practices which could be drawn upon to account for the loss of firefighters at Sun Valley. Another way of expressing the importance of previous practices and lack of other non-discursive resources is via a criticism of actor-network theory's managerialism and bias towards the 'big man of history'. Star (1991) for example argues that enrolling actors simultaneously involves a failure to enrol and/or the marginalisation of those non-enrolled.

Firefighters were sometimes reluctant to talk about the death of colleagues. One reason for this was that there were few practices which sustained the collective recovery of incidents through narrative-based accounts. Nonetheless one sub-officer, who had been with Hereford and Worcester Fire Brigade for over 25 years and was now on light duties (and was compiling an unofficial archive), recounted the death of two firefighters on 8 March 1974 at Hurcott Mills in Kidderminster, five days after several risk assessment inspections of the site and widespread communication of the risks posed to firefighters. His account emphasised the situated realities of fire incidents that cannot be known completely in advance and that demand improvisation (see for example, Weick, 1993), but also that information failure is marked out by absences. In this sense absent accounts presage

questions of the failure to enrol or disenrollment, as much as what is made visible by 'information failure'. In a passage from the interview, being able to account for the loss of lives in 1974 in terms of the failure of the management of information is challenged:

Firefighter: [We] lost two firefighters in 1974 [at Hurcott Mills].... they died on a Friday.

Researcher: So they had actually been there almost that week; ... it was that week.

Firefighter: ... a crew from another watch went there the previous week, looked at it—shock horror—better let the other watches know ... because of the concern expressed by the crew who had visited the place the previous week on the Monday.

He continues that after the risk assessment there was a fire five days later with two firefighter fatalities caused by a massive flashover triggered by polyurethane foam. This killed sub-officer Robert Crampin and firefighter Keith Marshall and injured several others:

that fellow that died in the incident, went [with two others] off on Monday morning to go and have a look at it they went along and said there's definitely a need here to get risk visits on it so luckily we did have a fair bit of knowledge about the building before we went in ...we also found out they had disconnected the sprinkler system.... No matter what information—sometimes you could provide people with every scrap of information that is available on a particular risk, but there is the occasion when no matter how much knowledge you've got tragedies will still occur ... [fire] places people in situations that you can't always train either physically or mentally for.

The firefighter's account of an incident over 25 years ago evokes a failure of information in two senses. The first is the impossibility of complete and *a priori* knowledge of the future. The second, and more important for this section, is that the absence of this firefighters' account is also an instantiation of information failure that demonstrates that what counts as information failure is an act of ontological construction that occurs in specific circumstances and delimits what is considered thinkable, speakable and doable. In terms of organisational learning, narratives from long-serving firefighters, the exchanging of 'war stories' between fire crews, for example, that bring together controversial and contradictory rhetorics of firefighting practice are absent from A4 folders that are comprised of formalised, single sentence bullet points (i.e., including type of construction, details of

hazards, special features and location of water supplies) and a standardised format of presentation (see Plates 1-5, Appendix 4 for examples), and therefore have no implications for fire crews' practices. The adoption of a technological innovation such as the VMDS is therefore presupposed and reliant upon comparison with existing paper-based technology because this is what is visible even if it is considered a failing technology: paper records are a way of seeing that is also a way of not seeing. This compromise between presence and absence is what Latour (1987) terms 'information'. But, as also stated above, this does not mean that those at Hereford and Worcester Fire Brigade are 'epistemological dopes' with firefighters, officers, researchers and others jostling to be purveyors of truth or false consciousness. The VMDS is rather taken seriously as the future of front-line firefighting at Hereford and Worcester Fire Brigade because variously situated effects are constructed, drawn on, elaborated and consolidated in order to construct an actor-world with obligatory passage points (Callon, 1986) through which the VMDS can pass. The important point is that discursive and non-discursive relations are interdependent and provide a limit and support for each other, with these relations bound up with the construction of particular forms of collective relevance (in terms of visibility, invisibility and absence) of 'information failure' at the brigade. The example of the invisibility of the loss of firefighters at a major fire in 1974 suggests that the constitution of information failure that led to the VMDS depended in a significant way on the largely formal, non-discursive practices through which information was maintained, shared and consulted on 1.(1).D records prior to the VMDS.⁴⁵

⁴⁵ In addition, the 'second generation VMDS', introduced in 2002 (see Chapter 9) continues this with the counter-posing of the 'second VMDS' from the 'first VMDS'. The phraseology for the second generation VMDS is well-trodden terrain for those familiar with the 'first generation' VMDS: the 'new' VMDS is able to 'link all types of documents', 'assist fire crews', help make more 'informed decisions' and 'improve functionality'. Given the similar claims of first and second generation VMDS the spectre problematises the narrative of technological development as providing the basis for a new and updated VMDS.

6.7 Universal Access, Standardisation and Regional Brigades

The introduction of the VMDS provided each fire crew at Hereford and Worcester Fire Brigade with real-time access to the same information from any fire appliance. Access to VMDS information was often described in terms of ‘universal access’: the VMDS is a powerful representation of the mobility, immutability and combinability often associated with IT. In contrast to ‘out of date’ paper records, which were organised and accessible according to the brigade’s station structure, the provision of front-line incident management through the VMDS promised coordination around universal information available to all fire crews regardless of location. This universal access also adds to rationales for different approaches of fire crew management particularly when contextualised against pressures to modernise the collective and institutionalised practices of the fire service’s negotiated order—an issue discussed in more detail in Chapter 7. Attending major incidents outside of turn out areas—at a distance from local stations—has always been a part of firefighters’ work but only in particular circumstances such as large-scale incidents or one-off cover for another fire crew. Flexible fire crew movement outside of traditional demarcated geographical/spatial boundaries (i.e., turn out areas) as routine practice has been, it was suggested in Chapter 4, an important part of attempts to enact modernised fire service provision (Audit Commission, 1995; Bain et al., 2002) and thus the search for solutions, whether these are technical, organisational or managerial, to such issues through which a modernised future can be enacted.

In addition to access to the same information, the management of risk records was transferred from stations to the newly formed Operational Intelligence Unit. The introduction of the VMDS was, then, part of a shift in the day-to-day coordination and control of the management of information away from fire crews and stations to new centres of calculation (Latour, 1987). The acceptance of the VMDS and Operational Intelligence

Unit by fire crews working at the 'periphery' of these new developments has therefore to be explained, particularly as senior officers at the brigade regularly informed me that firefighters almost always contested managerially driven initiatives. In actor-network terms this means examining how the VMDS is contextualised and decontextualised in particular networks (see also Bloomfield, 1991). The Chief Fire Officer described the attitude to the VMDS at Hereford and Worcester Fire Brigade in the following way:

There can be little doubt that the brigade has met the remit of the Health and Safety Executive in a practical and cost effective way. The system has met all of the criteria set by the brigade and the reaction by firefighters to the introduction of the computer into appliance cabs has been one of cooperation. The system is seen by all ranks, and in particular, those required to work at the scene of a fire, as a valuable tool which will assist them in their difficult task and provide them with immediate on the spot information both on screen and in hard copy (O'Dwyer, 1996: 37).

And an assistant divisional officer who was in part responsible for the VMDS stated that:

The system is popular with firefighters of all ranks and is now regarded by them as a vital part of vehicle equipment. Much of this confidence is due to the build and configuration of the hardware, system reliability, and the performance of the VMDS from day one as well as the intuitive software interface (Goodwin, 1997: 40).

Although these remarks are from senior officers at the brigade there were, at the time of the research, few voices of dissent from the view that the VMDS was a potentially useful tool to be deployed at incidents. It has already been discussed how the VMDS was constructed as a technical solution to the problem of firefighters being 'out of place' and that this explains, in part, the acceptance of the VMDS by fire crews: the responsibility for maintaining order at incidents is transferred to a mediating device—a process which Latour (1994) describes as 'technical mediation'. There are however additional ways in which the effect of the VMDS is contextualised (and decontextualised) that are important and these relate to the form of universality associated with the VMDS within Hereford and Worcester Fire Brigade.

The VMDS is associated with the provision of information that is universally available to all fire crews. In other words the VMDS standardises the information available to Hereford and Worcester Fire Brigade's fire crews because VMDS screens provide access to the same information, anytime and anywhere. Timmermans and Leiter (2000) suggest that standardisation can be understood in three dimensions: access, control and manageability, and that any attempt to standardise practices has to achieve a resolution of these contradictory requirements (see Porter, 1995; Latour, 1987; Star, 1991; Star and Bowker, 1999). Timmermans and Leiter (2000: 42) define standardisation in terms of 'the control of a diverse set of actors and actions conforming to a standard to guarantee uniformity and predictability. Indeed the hallmark of standardisation is uniformity through control, at the expense of restricted (or at least altered) individual autonomy'.

The VMDS is subject to the same preoccupations with access (i.e., who knows), control (i.e., how is knowing organised) and manageability (i.e., what are the limits of this knowing). In terms of the first dimension, standardisation as access, which is centred upon universality of VMDS information, the VMDS is accessible by fire crews *within* Hereford and Worcester Fire Brigade. In other words, the standardisation that the VMDS constitutes occurs within the geographical space of the brigade because the inscription of consistency is centred upon brigade standards not inter-brigade collaboration: VMDS standardisation is, then, not only technical, as it also presupposes particular organisational practices which are translated into a technical design (see also Monteiro and Hanseth, 1996: 334-6). Standardisation via the VMDS is, as such, mutually compatible with established county boundaries (rather than regional ones) for incident responsibility and this means that a range of actors within Hereford and Worcester Fire Brigade (e.g., full-time and retained firefighters, station officers, trade union representatives and senior officers) can be enrolled

with the VMDS because its implementation does not pose a significant challenge to bases of authority and autonomy as they are currently organised.

The formation of an Operational Intelligence Unit does constitute new forms of control of fire crews albeit control which does not significantly undermine fire crews' work at incidents or the social organisation of watches. For example, fire crews are expected to submit to new forms of surveillance from the newly formed Operational Intelligence Unit (e.g., checking on the completion of risk assessments, chasing the completion of risk forms to update the VMDS, and so on) but risk assessments are still carried out by fire crews. This matching of organisational structure and work routines with the VMDS meant that the VMDS was subject to less controversy and less visible, and as a consequence became part of the taken for granted infrastructure at the brigade relatively quickly (see Chapter 8 for a discussion of this). This invisibility was also supported by occasional rather than obligatory usage of the VMDS at the time the research was conducted. The VMDS and Operational Intelligence Unit is a brigade-centred approach to managing fire service provision which aligns and locates the demand for more explicit practices for safety with internal changes rather than external actors such as other fire brigades or local or central government bodies. In addition to this, even though the Operational Intelligence Unit centralised some activities the formation of this unit was not inconsistent with top-down institutional practices or unusual for firefighters.

The Operational Intelligence Unit was understood as providing a range of formalised procedures, checks and balances to fire crews' expert risk assessments which are then transferred to the VMDS through what Porter (1995) terms 'mechanical objectivity', which refers to the following of impersonalised rules and procedures in order to remove bias and subjectivity. This emphasis on formal procedures became more important after the Sun Valley fire because of external pressures to respond to the loss of firefighters' lives by the

Health and Safety Executive and to the distrust of existing station-based practices amongst fire crews and officers. Fire crews acknowledged, for instance, that before the VMDS there was a flexible but somewhat arbitrary practice of station-based A4 folders which meant that risks could remain unmonitored for a number of years: before the VMDS risk management practices reflected the culture of the brigade, but with the promise of the VMDS and Operational Intelligence Unit the brigade's practices would be epiphenomenal to technological and procedural innovations.

The brigade-centric approach to the VMDS also relates to the dimension of its manageability. In Chapter 4, Section 4.11 standardisation was associated with the range and depth of inter-operability of fire brigades' systems and practices. It was suggested that standardisation *qua* inter-operability has been contested over the last three decades because although fire brigades are subject to national frameworks and collective agreements there is also a significant legacy of brigade-centred decision making and local practice (see Chapter 4). Brigades have a legacy of their own practices in relation to, for instance, the technologies of mobilisation and communications at incidents (Bassett, 1992: 25). The particular form of standardisation the VMDS constitutes, in terms of access, control and manageability, can be conceptualised as 'brigade standardisation' or 'localised standardisation'. The VMDS is, in other words, bound up with managing boundaries that demarcate the internal organisation of the brigade vis-à-vis the external environment that is comprised of other brigades as well as local and central government.

It was argued in Section 6.5 that Hereford and Worcester Fire Brigade's VMDS was often associated with a strong rhetoric of radical and revolutionary change in the provision of fire services. Despite this, there are, as mentioned above, continuities with previous practices such as the organisation of watches and the use of formalised paper records. In addition, the VMDS was not the first technological mobile data system in the broad sense of

'information available on the move'. For example, in 1991, two years before the Sun Valley tragedy, West Midlands Fire Service, which 'has been singularly successful in keeping abreast of developments in computer-based information systems' (Sheehan, 1992: 38), introduced a computerised mobile radio data terminal and printer to fire appliances.

The development officer for West Midland Fire Service stated that:

The recognition that firefighters attending incidents need wide-ranging and complex information led to the examination of methods for providing such material for use at the incident ground.... the brigade issued a specification for a radio data system. Its concept is to utilise the database resources of the brigade to provide not only turnout information, but also information on water supplies, building plans, special risk procedures and hazardous substance information which will be sent in data format to mobile data terminals on appliances (Sheehan, 1992: 38-41).

Sheehan (1992: 38) continues that the West Midlands' mobile data system is an 'open system' which can respond quickly and efficiently 'to today's social, political and governmental requirements'. From this Sheehan concludes that West Midlands Fire Service has begun a strategic review of the uses of information and communication technology with a view to procuring advanced technologies in a more cost-effective way by offering the brigade's open system, with its remote data transmission to a terminal/printer and specialist IT services (e.g., hardware/software development, CAD/CAM operators/updates, GIS management, etc.), to other brigades.

The West Midlands Fire Service is a large metropolitan brigade responsible for the provision of fire services to the second largest city in the UK and is, according to its own officers, 'at the forefront of Fire Service information technology by its strategic approach' (Sheehan, 1992: 40). This 'high-technology' brigade shares a significant geographical boundary, and on occasion attends incidents jointly, with Hereford and Worcester Fire Brigade—a brigade that is smaller in size, less visible in national debates, and considered to be something of a laggard in the modernisation of its practices (see Cox, 1994: 27). On the issue of interoperability, Bassett (1992: 26) writes that the early 1990s was a period of

intense controversy about local government restructuring, fire service boundaries, and relations to other emergency services which included:

sticking plaster solutions, shared controls, regional controls.... After the initial hiatus it is encouraging that there is now a genuine consensus on the way forward. The Home Office, local authority and fire service organisations seem to agree that we must get on with our replacement mobs/coms [mobilisation and communications] systems, but in a flexible way that will facilitate rather than frustrate whatever restructuring may come.

A further instance of the controversy surrounding regionalisation, albeit in the form of a joke, was demonstrated at a meeting tasked with developing the future functionality of the VMDS. Whilst discussing technical options for communicating status messages to the central command and control a firefighter made a suggestion that would provide other brigades with access to the VMDS. The assistant divisional officer responsible for the VMDS mocked the firefighter and replied: 'Drop that idea ... they might start thinking about regionalisation'.

Contextualising the VMDS in relation to the 1990s debate of the possibility of regionalised fire services means that the VMDS is not only a technological tool introduced in response to a lack of information to fire crews, but can be brigade-centred development that is implicated in attempts to manage levels of autonomy and discretion at Hereford and Worcester Fire Brigade in the face of potential regionalisation through the alignment of the VMDS with existing structures, practices and assumptions. This attempted alignment is an example of Star and Bowker's (1999: 5) claim that every attempt to standardise valorises a particular set of assumptions and practices and silences others. Maintaining control over the boundaries of Hereford and Worcester Fire Brigade through the VMDS, in the context of ongoing national discussion about regionalisation, is an attempt to sustain control and discretion over external political pressures demanding the modernisation of fire services. The introduction of a universally accessible VMDS, formalised procedures and internal

controls demonstrates the existence of a custodial and professional ethos to increase effectiveness and manage accountability within brigades. It is an attempt to enact a particular version of the future, a future which is centred around county-based brigades.

The VMDS also marks out a means of catching up with other brigades particularly the neighbouring and rival 'high-tech' brigade, and denotes an attempt to integrate Hereford and Worcester Fire Brigade into the select group of brigades that are at the forefront of technological innovations. At Hereford and Worcester Fire Brigade these hopes and fears (see, for example, Mulkay, 1993) centre upon attempts to preserve and enhance the brigade's ability to influence future decision making in relation to, amongst other things, any decision to shift toward a regionalised structure. If regionalisation were to take place a potential regional structure would, for example, be that Hereford and Worcester Fire Brigade could be subsumed into a larger West Midlands Fire Service, with whom northerly boundaries are shared. Alternatively Hereford and Worcester Fire Brigade could merge with other similarly rural neighbouring brigades on its southerly boundaries. Interoperability between 'open systems' at West Midlands Fire Service and the strategy of providing services to other brigades could be drawn upon as one basis amongst others for deciding the boundaries of a regionalised fire service. To the extent that the VMDS and the Operational Intelligence Unit becomes an institutionalised centre of calculation in (and beyond) the brigade, and this institutionalisation has shaped other decisions, Hereford and Worcester Fire Brigade is in a stronger position to mediate other brigades' inscriptions. This 'irreversibility' (Callon, 1986, 1987, 1992) takes the form of not being able to return to the point where the decision to introduce the VMDS was one amongst many and the difficulty of unravelling decisions made after the introduction of the VMDS.

6.8 Concluding Remarks

There are a number of points that can be reiterated and developed in concluding this chapter. The claim that the VMDS is simply a means to resolve the problems of a technical information failure has been problematised. The VMDS is a potent inscription device at Hereford and Worcester Fire Brigade that is deployed to envision the provision of efficient and effective fire services around information that is mobile, immutable and combinable. This means that the VMDS is constitutive of a vision of order at the brigade that distributes roles, competencies and accountability in particular ways. This vision of an information-based order is constructed through acts of purification and translation that contextualised and decontextualised the VMDS. This included the problematisation of the deaths of firefighters in terms of insufficient information to the right people at the right time, the enrolment of Health and Safety reports into the service of formalised information management practices, the disenrollment of non-technical explanations of the fatalities, and the mobilisation of existing paper-based practices as the basis for the implementation of the VMDS.

The argument that the VMDS distributes roles, competencies and accountability has also been examined in terms of the future of fire service provision and as part of this the revolutionary rhetoric of the VMDS has been problematised. The VMDS and the Operational Intelligence Unit are centres of calculation at Hereford and Worcester Fire Brigade through which attempts to align future actions and decisions are made. From this it has been argued that the VMDS is an instrument and outcome of power within and beyond Hereford and Worcester Fire Brigade. Larger brigades such as West Midlands Fire Service are interested in furthering the interoperability of mobile data systems because this affords opportunities to dominate the management of future fire service provision. Smaller brigades, in contrast, such as Hereford and Worcester Fire Brigade are more concerned with

influencing the direction of interoperability and/or regionalisation in ways that maintain their distinctive role. The implementation of the VMDS, which was managed by senior officers within the brigade, was commensurate with existing practices and a disciplinary vision of the future of fire services as brigade-centric. Tailoring the VMDS in particular ways through the formal design and scope of the VMDS was afforded in part because the VMDS was an internal, brigade development which was not associated with other mobile data innovations in other fire brigades.

Instead of conceptualising the VMDS as either centralising or decentralising power within or between brigades, an approach is required that encompasses the mutual dependencies of centralisation and decentralisation. For instance, centralisation of information to the Operational Intelligence Unit is simultaneously an attempt to maintain a decentralised or county level brigade structure against the prospect of regionalisation. Additionally, the setting up of the Operational Intelligence Unit also occurs with the decentralisation of access of VMDS records together with an explicit rhetoric of enhanced information autonomy to front-line fire crews. Given that the VMDS is a representation of the future of firefighting, and despite the reorganisation of the management of information to the Operational Intelligence Unit, the limits of decentralised fire crew access in terms of crews' limited discretion could be a potential basis for reworking the limited autonomy of fire crews. In other words the standardisation associated with the VMDS, which is universal access, makes aspects of fire crews' and the Operational Intelligence Unit's work visible in new ways. In place of the notion of the centralisation or decentralisation of power there is instead 'a qualitative change in the character of power relationships between relevant parties' such that 'new organisational games' (Bloomfield and Coombs, 1992: 480-81) are constituted for the way Hereford and Worcester Fire Brigade understands itself and its past, present and future activities.

Chapter 7: The VMDS as Multiple Object

‘Organisations, finally, no longer look the same now that their local interactions, and to their dispatchers, have been added so many computers and data banks. So many artefacts and intellectual technologies, so many stories, so many centres of calculation and information processing rooms, so much distributed and situated cognition. It is no longer clear if a computer system is a limited form of organisation or if an organisation is an expanded form of computer system. Not because, as in the engineering dreams and the sociologist’s nightmares, complete rationalisation would have taken place, but because, on the opposite, the two monstrous hybrids are now coextensive’.

Bruno Latour ‘Social Theory and the Study of Computerised Work Sites’.

‘In this version of knowing, the epistemological (issues to do with knowing or knowing well) is bound up with the ontological (the question of what exists). What is, as well as the knowledge of what is, are produced together. A caution: this does not mean that anything goes, that any old world or reality can be enacted into being’.

John Law, ‘Knowing as Displacing’.

7.1 Introduction

Technological innovations are successfully taken up because a social vision and a technical purpose are aligned through tireless working across heterogeneous domains. So argues Callon (1987) in a classic actor-network study of the efforts of engineers at Electricité de France (EDF) to develop an electric car for French consumers. Callon follows the engineers at EDF who, as ‘engineer-sociologists’, simultaneously have to set out the detail of technical equipment and articulate the structure of society into which the introduction of electric cars is appropriate. But as Callon sets out, the engineers at EDF do not have things just their own way. Rival engineers at the car company manufacturer, Renault, who are interested in mobilising French citizens around the internal combustion engine, attempt to counter EDF’s proposed innovation by enrolling potential consumers around the technical constraints and the incompatibility of electric cars with French society (see also Sismondo, 2004). The success or failure of electric cars is the outcome of ‘tribunals’ in which the effects of electric cars and combustion engines are determined and distributed.

In addition to the inseparability of technical and social domains Callon’s study of EDF demonstrates an approach to technoscience that is based upon a broad Foucauldian genealogy (see also Chapter 5). The focus here is not upon foundational causes but upon the construction of effects through a heterogeneous relationality that constitutes the context and the content of organisational activities. Symmetrical genealogy follows the ‘transversal’ or ‘rhizomatic’ movements, trials, associations and alliances between, for instance, scientific and non-scientific domains, with alliances comprising of commercial financiers, governmental fund holders, regulators, consumers, technology suppliers, and, symmetrically, other technological devices, to name a few. Massumi (2002: 215), for example, suggests that associations and alliances vary in the degree of formalisation but ‘they are far more elaborated and dependable than common sense or gossip. They attest that

there are many degrees of reality or forms of transition populating the interval between factoid and bare fact'. Law (1992, 1999) similarly argues that objects are defined by their location in heterogeneous networks and this marks out a 'relational materiality' or 'relational ontology'. The relational effect that constructs a technological object can be delineated, as previous chapters have suggested, into two interdependent parts. The first is making determinate or problematisation—differentiation—and the second is making different or transformation—differentiation. This chapter focuses upon the differentiations associated with the VMDS (see Chapter 6 for an examination of making determinate/problematisation). The emphasis upon differentiation means that the VMDS is a multiple object that is a 'mutable mobile'.

This chapter examines three translations/transversal movements associated with the deployment of the VMDS, and provides an account of the simultaneous transformation of the VMDS as 'tool' of organisational practices, and of the contextualisation of modernisation associated with the provision of fire services. Usage of the VMDS is more like the opening of a 'Trojan door' of translations than interacting with a 'black-box' (see Star, 1992; Berg, 1997, 1998). Law (1992: 386) describes translation, as 'a verb which implies transformation and the possibility of equivalence, the possibility that one thing (for example, an actor) may stand for another (for instance a network)'. Translation marks out how the movement of people, artefacts, documents, skills or practices implies transformation, surprise and unexpected connections rather than replication or diffusion. In order to follow translations associated with the VMDS this chapter is organised in the following way. The next section reiterates concepts discussed in Chapters 2 and 3 through Deleuze's delineation of reality into two pairs: the virtual-actual and possible-real. The second part of Deleuze's relational ontology—differentiation, making different—is demonstrated in Sections 7.3 to 7.5. Translation/transformation of the VMDS is the mark of

diffenciation (see Chapter 6, Section 6.2 for more detail on the difference as differentiation).

Section 7.3 examines how the VMDS is mobilised to monitor and record fire crews' performance. This translation occurs through the top-down, internal connection of the VMDS to the brigade's command and control centre and the relaying of status messages from fire crews to the mobilising centre (e.g., crew on the way to an incident, current location of crew, number of crew on the appliance, etc.). It is an example of an outcome of a translation that Law (2000: 353) terms 'consistency' because 'two knowledges and two realities are successfully enacted as dovetailing together'. In addition Hereford and Worcester Fire Brigade aligns the VMDS with a broad agenda for modernising fire services but in a way that simultaneously reaffirms the primacy of brigade-level management and coordination: although the VMDS is enrolled in changes in performance measurement, the VMDS is also appropriated as part of attempts to locate the focus of external demands within the brigade. The VMDS is, then, associated with consistency within the brigade and, at the same time, of maintaining continuity of brigade-centric institutional practices.

Section 7.4 examines another mobilisation of the VMDS: this translation comprises of the introduction of new form of firefighter mobility and how the VMDS, with the universal access it affords, is enrolled in 'global crewing'. In Law's (2000: 353) terms this is an example of an outcome of translation that is characterised by 'distinct inclusion' as well as consistent alignment. 'Distinct inclusion' means that the VMDS is not a prerequisite for, or rendered equivalent to, global crewing but it is apparent that universal access is included within the translation of brigade practices toward global crewing. In addition, as the VMDS becomes mobilised for new organisational practices for managing fire crews, the delegation to VMDS-mediated mobility constitutes new forms of spatial and temporal ordering and disordering. It is also argued that as the actor-world of the VMDS and global crewing

encounter each other VMDS-mediated mobility defers other issues (e.g., early retiring officers, recruitment problems) and changes (e.g., managing levels of absenteeism and stress-related illness) within the brigade. The third translation examined in Section 7.5 is a failed translation—what Law (2000) describes as ‘inconsistent’ translation. This attempted but failed mobilisation of the VMDS demonstrates how the technological capacities of the VMDS can be enrolled in efforts to bring about change but this does not mean that the technical capacities of the VMDS can be translated in an unlimited number of ways. In this instance translation fails to bring about changes to organisational practices not because of the inherent technical capacities of the VMDS but because the virtual-actual and possible-real constitute the potentialities and boundaries of VMDS-induced change. The final section reiterates key points from the chapter and concludes that an approach focused upon transversal movement reorients the notions of the ‘success’ and ‘failure’ of technological innovations such as the VMDS. It is worth remarking that this should not be understood as contending that the VMDS can become anything or that its relational effects are somehow arbitrary. The VMDS is, rather, densely located in, and enacts, arrangements of practices, devices, habits, activities and routines, which are indeterminate and relational. It is through detailed empirical exposition that the indeterminacy and relationality of the VMDS can be articulated and made visible.

7.2 Relational Effects Searching for IT: The Ontology of Possible-Real, Virtual-Actual

The ontological status of indispensable and innumerable quasi-objects is described by

Latour (1988: 80) in the following terms:

Did the microbe exist before Pasteur? From the practical point of view—I say practical, not theoretical—it did not. Scientists, technologists, amongst others, produce new (quasi-)objects, initially in laboratory/research ‘trials’ but if successful quasi-objects move from uncertainty to become things.... things isolated from the laboratory conditions that shaped them, things with a name that now seem independent from trials in which they proved their mettle.

The symmetrical recovery of the discursive and non-discursive relations that constitute quasi-subjects and quasi-objects in isolation from the heterogeneous conditions that shape them can also be described in terms of a movement from the possible-real (i.e., as causal, discrete thing) to the virtual-actual (i.e., as relational, achieved effect). Recovering the ways in which effects are stripped of relationality and considered discrete objects does not mean that technologies have to disappear as a category to work with or cannot be articulated in collective discourse—this is not the ‘death of technology’ or its disappearance into a ‘flow of becoming’, but a form of inquiry which produces a genealogical account of relational effects that constitute a technological device rather than accepted self-evident causes. For the purposes of this chapter, doing this turns the being of technology (that is, discrete entity/device) into the becoming of technology (that is, a relational effect).

Deleuze (1988, 1994) proposes that there are four modes of reality and that these can be delineated into two pairs: real-possible and actual-virtual. These pairings, possible-real and virtual-actual, have often been mapped onto ‘being’ and ‘becoming’ respectively (for more discussion, see Chapter 3). For Deleuze, the relations between possible-real denote a concern with a delimited set of cause and effect. The relationship between possible and real is one of causation, where the real is caused by preceding but finite number of possibilities. In contrast to this, Deleuze argues that the virtual cannot be equated with the possible (that is, not with an unfulfilled possibility). The virtual and actual mark out ‘a mutation of identity, a displacement of the centre of ontological gravity of the object considered: in place of principally defining itself by its actuality (a “solution”), the entity henceforth finds itself within a field of the problematic’ (Levy, 1998: 16). Here actualisation is a relational effect not of preceding possibilities but of differentiations that are transformations. In this way the pairing of virtual-actual makes a qualitative break with the model of practices diffusing/travelling across times and places without deformation and replaces the

assumptions of diffusion with a focus on capacities as relational effects comprised of transversal/transformational movement.

Deleuze (1994) privileges the virtual-actual because this is marked out by relational effects. Nonetheless mixtures of possible-real are important for at least two reasons (see Chapter 3 for an extended discussion). First, the pairing of possible-real, which focuses upon possible capacities made real, can be reworked to recover their virtual-actual character. This occurs through a genealogical re-evaluation of foundational causes into relational effects. Second, the possible and real engenders the articulation of virtual-actual. This means, for instance, that technologies such as the VMDS can be understood as both/and mixtures of the two pairings (see Chapter 3, Section 3.6-3.7). The critical and creative role of the researcher is to induce movement such that causes (i.e., mixtures of possible-real) are reconfigured into effects (i.e., mixtures of virtual-actual).

7.3 Fire Crews' Status Updates, Brigade Performance and Mobile Data

Chapters 4 and 6 described how the VMDS at Hereford and Worcester Fire Brigade became part of a wider problematic and historical ambition to modernise and streamline the provision of UK fire services. A central part of the vision of fire service provision in recent government reviews (see, also, Chapter 4, Sections 4.8 and 4.9) is the demand for wide-ranging performance indicators centred upon outputs measures,⁴⁶ with the VMDS implicated in how the modernisation of fire services is worked out. The VMDS is, for example, associated with providing reliable and timely information to firefighters thus making situated, tacit knowledge less important (cf., Tsoukas and Chia, 2002). In addition, demands to modernise comprise of developing managerial competencies through new ways

⁴⁶ 'Officers in Charge have more information to deal with fires ... greatly improving the Brigade's efficiency, effectiveness and Health and Safety' ('The Grapevine', Hereford and Worcester Fire Brigade, Summer, 1997: 8-9). Access to information is associated with 'efficiency' and 'effectiveness'.

of accounting and measuring for the provision of fire services to, for example, the Audit Commission and the HM Fire Service Inspectorate. In terms of the VMDS this denotes formalised procedures to audit and trace the way information gets onto the VMDS and, as discussed below, the monitoring and compilation of information for fire crews' usage of the VMDS (see, for example, Power 1997). The dual dimension of brigade modernisation (i.e., auditability and performance/usage figures) places demands upon the Operational Intelligence Unit not only to maintain formal procedures and account for them but also make fire crews' activities visible in new ways. This occurs, in part, through monitoring fire crew usage of the VMDS (see Zuboff, 1988).

The previous section discussed centralisation in relation to the management of risk records and the formation of the Operational Intelligence Unit. The assistant divisional officer at Droitwich who was initially responsible for preliminary research into the introduction of a brigade-wide incident information system described how the VMDS is an instantiation of a centralisation of decision-making within Hereford and Worcester Fire Brigade:

I think recently one the biggest changes I've seen is this very much centralist controlling type of management, that all decisions must be made and nobody is allowed to make decision and if they do it's not very healthy. And my concern is that obviously people get out of the habit of making decisions.

Later in the interview, the assistant divisional officer described the formation of the Operational Intelligence Unit at Hereford and Worcester Fire Brigade:

Asst. Div Officer: ... I was then moved from the whole thing and put here [in the training unit] if you like. Because I used to run the Operational Intelligence Unit which is now Operational Support.

Researcher: What is Operational Support? That was actually formed after the Improvement Notice, wasn't it?

Asst. Div Officer: Well the Operational Intelligence Unit was formed because of the Improvement Notices, we identified that we needed a group to gather intelligence of all that was going on out there and how it affected our health and safety. We were only the second brigade in the country to start the idea of Operational Intelligence [...] Now if you were dealing with Operational Intelligence or the VMDS information comes that particular leading firefighter [who] deals with the cow

stuck on top of the tree for the first time, feeds it into our systems so that when the next person get a cow in the tree they've got the actual model ... and that's what we're trying to build with the VMDS. I think it's been kind of hijacked slightly [...].

Researcher: That's what I was going to say I mean is that what the VMDS—I mean as far as I understand it that isn't really how the VMDS [information] actually gets put on there.

Asst. Div Officer: It's a closed system.

Researcher: It seems very centralised?

Asst. Div Officer: It used to be an open unit. It was designed to be an open system [...].

Researcher: The idea was that you could sort of put—share your [incident] experiences on screen?

Asst. Div Officer: Exactly, exactly.

For the assistant divisional officer progress is associated with information and communication technologies that enable devolved information management at incidents. In contrast the officer describes the VMDS as associated with centralised control and coordination from the Operational Intelligence Unit—the minimally centralised structure, which the officer envisaged would foster decentralised, 'bottom-up' collaboration and learning between fire crews has been translated into a centralised organisational form. The relative merits of top-down or bottom-up approaches can be debated but for the purposes of this chapter the important observation is that the strengthening of bureaucratic hierarchies is commonplace when there are attempts to discipline local practices through the introduction of formalised procedures (see also Section 7.4). With the VMDS, fire crews get access to information they either did not have before or which had to be communicated via the brigade's radio network from the command and control centre. Yet tasks and responsibilities associated with new forms of access occur through the brigade's Operational Intelligence Unit and this affects what is meant by hierarchy at Hereford and Worcester Fire Brigade (see also Chapter 8).

The 'closed system' that the assistant divisional officer describes above became aligned with other developments at Hereford and Worcester Fire Brigade in early 1998: in addition to the accumulation of inscriptions at the brigade's Operational Intelligence Unit, new tasks

and responsibilities, centring upon the relaying of status messages between fire crews and the command and control centre, become centred upon the VMDS. This is another instantiation of attempts to strengthen the brigade's bureaucratic practices, but it also demonstrates the relational ontology of the VMDS. Prior to the VMDS, fire crews' status updates and messages (e.g., location of fire appliance, attending an incident, etc.) had been communicated by radio to the brigade's command and control centre. In early 1998, some two years after the VMDS has been introduced in March 1996, Hereford and Worcester Fire Brigade began testing a prototype for relaying status updates and messages via VMDS screens.

The translation of the VMDS into a technological device which is connected to the command and control centre becomes, it is argued below, a means to reinforce existing organisational boundaries, brigade authority and officer competency. It is suggested that this translation of the VMDS demonstrates how understanding the VMDS as a tool (with a particular means-ends relation) is analytically and empirical unhelpful. Tools are associated with strong associations of control and mastery (see Chapter 2, Section 2.1) but the translation of the VMDS into a device for communicating and monitoring fire crews' activities problematises commonsense assumptions of technologies as tools.

During the research I was invited to attend a meeting tasked with developing the VMDS. This meeting included evaluating the design of a prototype addition to the VMDS that incorporated, in the first instance, commonly used status updates/messages (but also the development of comprehensive recording of performance indicators via the VMDS). The consultant from the external supplier of the VMDS described how the VMDS can be used

to provide performance information once the VMDS is connected to the brigade's command and control centre.⁴⁷

Once the interface software was complete and a suitable modem incorporating GPS was interfaced to the VMDS, it became possible to transmit not only the status update but also the grid position of the vehicle. Exciting stuff. Each status message was recorded on the VMDS audit log thus providing statistics for Performance Indicators with times accurate to a 10th of a second.... With radio connectivity, other features become available and the VMDS could be used to provide a wealth of information back to the brigade [command and control centre]. For example, details of the 'riders' [firefighters], statistics relating to vehicle movements and usage, etc., and real time information' (Humphreys, 1997: 41).

The preoccupation with measuring performance in UK fire services is related, as discussed in Chapter 4, to a generaliseable and well documented preoccupation with measuring and managing performance in the public sector. The fire service introduced the Output Measures and Performance Indicators Scheme (OMPIS) in 1993 and these provided explicit comparative measures of brigades' activity.⁴⁸ According to a previous Home Secretary, the purpose of introducing performance measures was to help local authorities allocate resources amongst competing services but it has also led to comparison between brigades: 'The information [given] will be of value to brigade management not only in the more effective and efficient management of their resources but also as part of the local process of apportioning allocated funds amongst local authority services' (Howard, 1994: 3, quoted in Stirling and Fitzgerald, 1997: 25).

The development of 'best value'⁴⁹ within local government at the end of the 1990s introduced a further form of comparative performance measurement focused on efficiency improvements (see Miller, 2005). This marks an attempt to shift the emphasis on

⁴⁷ The sales director of Joyce-Loebl Ltd, the technology supplier, wrote that the 'Chief Fire Officer [Hereford and Worcester Fire Brigade] ... advanced his view that the utility of the VMDS could be enhanced if it were to be connected to the brigade's mobilising control room' (Humphreys, 1997: 41).

⁴⁸ The administrative practices associated with performance measures have often been concurrent with the devolvement of budgets to a divisional and/or station level.

⁴⁹ 'Best value' is defined as the introduction and monitoring of organisational practices 'to secure continuous improvement in the way in which they [fire authorities] exercise their functions, having regard to a combination of economy, efficiency and effectiveness' (Lord, 2002: 1).

performance indicators from measuring attendance time to monitoring a wider range of outcomes as the Audit Commission's (1995: 35) report states:

This shift in the methodology and responsibility for risk assessment needs to be accompanied by a shift in the focus of the Inspectorate to monitor outcomes (such as reductions in casualties, property loss and fire, increasing public awareness of fire safety issues, and, perhaps, rescues made), as well as the achievement of attendance standards.... but these [attendance standards] would cease to be regarded as the primary indicator of performance.

In conjunction with Best Value Reviews there is an emphasis upon diffusing best practice via the Best Value Inspectorate from individual brigades to the wider fire service community and in this way Best Value initiatives are constitutive of broader ambitions to audit brigades' performance and standardise fire provision in order to bring about efficiency gains (e.g., regionalise activities such as procurement and command and control centres) based upon inter-brigade comparison. The HM Chief Inspectorate's Report of Fire Services in England and Wales makes this point:

One of the key needs for the delivery of these [that is performance improvement through best value] is for authorities and brigades to work more closely together. There is clearly a significant benefit to be had from the pooling of knowledge and the removal of unnecessary duplication. There is also an urgent need in many brigades to improve arrangements for the collection of, and access to data related to performance measurement and management information (HM Chief Inspector Report of Fire Services for England and Wales, 1999/00, 2001: 4).

The connection between Best Value Performance Indicators,⁵⁰ mobile data systems such as the VMDS and inter-operability between brigades was illustrated by the Chief and Assistant Chief Fire Officers' Association Mobile Data Task Group's research study in September 2000 into current and future provision of mobile data. Their report comprised of

⁵⁰ Performance targets or Best Value Performance Indicators (BVPI) are set for a wide range of operational, response, organisational, community education and corporate management activities including: total number of fires (Li 1); number of deaths per 100,000 population (BVPI 143i); percentage of accidental fires in dwellings confined to the room of origin (BVPI 144b); attendance time to national standards (BVPI 145c); and number of days lost to sickness (BVPI 12a), etc. (Hereford and Worcester Fire Brigade, 2003). Fire authorities' performance is assessed on a yearly basis against a series of national standards of cover, Best Value Performance Indicators (BVPI) with HM Fire Inspectorates monitoring the compliance together with Audit Commission reports (Bain et al., 2002: 47, 59). Explicit comparative performance assessments were introduced in 2003 in response to a local government White Paper: 'The Audit Commission has led the introduction of Comprehensive Performance Assessment (CPAs) for county and single-tier authorities.... CPA looks at performance across the board and assesses authorities as excellent, good, fair, weak or poor. Better performance leads to greater flexibilities and freedoms for the authorities' (Bain et al., 2002: 47).

detailed specifications for hardware and software with descriptions of approaches to mobile data that are currently in use. In addition it also comprised of substantial discussion and recommendations, as part of its findings and conclusions, on the standardisation and inter-operability of mobile data across brigades. The report concluded, for instance, that inter-operability within and between emergency services is the defining feature of the efficient coordination of emergency service provision and the most cost-effective deployment of resources (Fire Service Mobile Data Task Group, 2002: 9).

It was argued in Chapter 6 that the form and content of standardisation and inter-operability of mobile data systems (such as the VMDS) is marked out by the way in which the heterogeneous networks of existing practices and assumptions are inscribed into the vision of management through VMDS-mediated information. Doorewaard and van Bijsterveld (2001: 56) term inscription as intermingling or 'osmosis' (as opposed to common associations of technological 'impact'):

Actors, involved in IT change programs, do not simply echo a newly introduced vision on IT management. They continuously evaluate the recently gained insights both in light of the existing organizational IT management practices, and in light of their own implicit and explicit assumptions concerning successful IT management. They relentlessly reshape this set of contemporary notions, and they engrave a mixture of new and old insights into an emerging technological and organizational setting.

This negotiated 'mixture of new and old insights' of VMDS-mediated status messages takes two forms at Hereford and Worcester Fire Brigade. Firstly, the simultaneous alignment of the connection of the VMDS to the command and control centre with national mobile data recommendations for inter-operability, but, secondly, the attachment and consolidation of existing brigade-level organisational practice and authority through the collection and analysis of performance *within* the brigade.

Aligning the VMDS with Home Office recommendations comprised, in other words, of adopting one of the technical recommendations of the 1994 Smith Report (see Chapter 4,

Section 4.10). Before the VMDS was introduced in early 1996, the Smith Report recommended that fire brigades should develop common technical and non-technical interfaces for mobilising fire appliances and the content of mobile information should be comprised of status messages (as opposed to other types of information such as 1.(1).D records or chemical information). However, as Chapter 6 set out the implementation of the VMDS was centred around the provision of 1.(1).D records, chemical information and building plans via VMDS screens, but did not provide a link to the command and control centre neither did the VMDS comprise of status messages as the Smith Report had recommended.⁵¹ With the establishment of a technological connection to the command and control centre and the introduction of communication of status messages via VMDS screens, the brigade aligns its practices with national recommendations of the Smith Report for the content of mobile data.

The Smith Report's other recommendation—that is, the development of common interfaces between brigades—did not, however, feature, at the time the research was conducted, as part of the development of the VMDS at the brigade. Hereford and Worcester Fire Brigade actively adopted elements of national recommendations in terms of the content of mobile data (recommendations that are also designed to foster standardisation and inter-operability between brigades) but does so without calling for changes to the brigade's boundaries, bases of authority and levels of inter-operability between brigades. Connecting the VMDS to the command and control centre and sending status updates/performance indicators via the VMDS becomes, in other words, a counter-enrolment of actors within and beyond the brigade to a vision of fire service information management in which there are already coherent and competent internal practices that compile, record and monitor the brigade's activities internally. If this counter-enrolment is sustained and becomes difficult to unravel

⁵¹ 'First generation' VMDS did not have the functionality for communication from the control centre.

(see Callon, 1986), the implication is that there does not need to be external intervention (by the Audit Commission, other brigades, etc.) to introduce competent and professional management practice into what are 'internal' brigade matters.

The development of status messaging through the VMDS, and the recording of this information at the command and control centre, illustrates how technologies can be deployed to buttress organisational forms as much as the more common association with changing organisational forms; in this instance, against potential restructuring along regional lines. The Smith Report's recommendations of simultaneous technical and non-technical inter-operability is translated into brigade-level technological change that follows the Smith Report in the technical sense but downplays its organisational implications. This means that existing practices are updated into new ones which measure brigades' activities in terms of BVPIs and these new practices in turn constitute further a brigade-level legacy that has to be overturned before the boundaries and authority of Hereford and Worcester Fire Brigade can be changed. The partial adoption of national recommendations reorients out-right confrontation because, firstly, formulating the Smith Report's recommendations in technical terms has led to the brigade adopting new practices, and, secondly, by aligning the modernisation of fire services with technological innovation rather than inter-organisational change. Additionally this delimited embracing of the Smith Report also maintains a sense of the authority and influence of national reviews in bringing about changes within brigades whilst simultaneously not implementing a number of the report's recommendations. The implementation of advanced information and communication technology provides a basis for not adopting a particular definition of modernisation as organisational change at brigade level!

The debate about inter-operability continued throughout the late 1990s with, for example, a report on mobile data produced by the CACFOA Mobile Data Task Group in 2002 and

Best Value Reviews of command and control centres in 2003. The Fire Service Mobile Data Task Group report sets out how standardised technological interfaces are important but, in contrast to the emphasis on technological modernisation at Hereford and Worcester Fire Brigade, argues that it is not technology *per se* that provides standardisation and interoperability:

As the study progressed it became apparent that there was a fundamental problem with satisfying the “vision” of mobile data.... no standard methodology exists in fire brigades or anywhere else that would enable brigades to audit their current systems and to assess and analyse the organisational data requirements that would be required to support mobile data and to plan effectively for the future (Fire Service Mobile Data Task Group, 2002: ii).

The report concluded that the time and resources deployed in implementing mobile data innovations is cost-effective (defined in terms of efficiency and best value) only inasmuch as it occurs in conjunction with standardised, administrative practices that harmonise the approach to technological interfaces across brigades and this is only achievable by standardising and coordinating *non-technical* activities. The report states that:

The information required for mobile data systems is gleaned from many different areas in each fire brigade and all brigades have legacy systems that often do not interact. Further, some brigades may have invested in hardware and are unable to service the equipment with relevant and timely information because of problems in *managing the data* (Fire Service Mobile Data Task Group, 2002: ii, emphasis added).

The report illustrates two points. The first is that whereas the Mobile Data report associates cost-effectiveness with standardised organisational/administrative practices (following the 1994 Smith Report), in contrast, cost-effectiveness at Hereford and Worcester Fire Brigade is aligned with a technologically-based modernisation of fire service provision.⁵² The second point is that the report demonstrates that Hereford and Worcester Fire Brigade is not

⁵² Hoskin and Macve (1998) provide a genealogy of managerialism in the US and analyse the conditions for management techniques (e.g., time and motion studies) being associated with functionality and cost-effectiveness. Hoskin and Macve provide evidence to suggest that it is only when such techniques are conjoined with disciplinary practices (i.e., social technologies of control and coordination), which are taken from the elite educational institution at West Point and translated into an economic context that make activities visible and comparable, that these techniques are associated with cost-effectiveness and worth adopting. The Fire Service Mobile Data Task Group similarly conclude that administrative standardisation is critical for the deployment of information and communication technologies.

an exception within UK fire services but that other brigades have similarly implemented and aligned mobile data technology with existing brigade assumptions and boundaries:

Amongst the conclusions of the Smith Report was a statement that unless a common strategy was adopted there would be a nugatory effect and expenditure in the development of individual systems. In June 2000, twenty or so fire brigades in the United Kingdom had or were installing mobile data systems, there was no commonality or standard. Lessons learned in one brigade were being re-learned in others and manufacturers were at a loss to understand what it was the fire brigade required as a whole. Clearly it was not cost-effective to develop a different system for every brigade (Fire Service Mobile Data Task Group, 2002: 5).

The task force concluded that in the short to medium term it was very unlikely that current brigade practices in the UK could be replaced with a common fire service system for mobile data:

There was a consensus that brigades are generally unwilling to accept a national and common risk data collection form 1.(1).D for several reasons which includes: currently populated legacy systems; historical and established use of brigade designed forms and questionnaires; special to county topographical and demographic risk factors requiring perhaps unique questions to be set by the local brigade (Fire Service Mobile Data Task Group, 2002: 22).⁵³

Brigades are similarly resistant to attempts to rationalise the number of command and control rooms, particularly those which receive less than 20,000 incident calls each year. This provides another illustration of the way fire brigades appropriate external recommendations to different ends. A recent government commentary on Best Value Reviews conducted by brigades (HMFSI, 2003; see also Bain et al., 2002: 49) stated that only five brigades undertook the Best Value Reviews 'with an open mind taking into account the national guidance ... nearly all authorities have opted to maintain the status quo ... [and] approximately one-third of authorities have used public opinion to reinforce the case for retaining their control room within the brigade area.... despite the strong "messages" given that joint fire service control rooms were preferred' (HMFSI, 2003: 3-4).

⁵³ 'Brigades were unanimous in their desire to share information. However, at the time of the completion of the questionnaire, no one brigade has a working system in place to meet the requirements electronically. Some brigades have arrangements under Section 2 and 12 agreements to exchange risk data sheets [1.(1).D] and tactical information plans by issuing them in hard copy or in an agreed electronic format (e.g., MS Word)' (Fire Service Mobile Data Task Group, 2002: 24).

The contestation of central government initiatives—joint command and control rooms in this instance—but also ‘modernisation’ more generally is articulated at a number of levels but also in a number of ways in UK fire services. For example, the President of the Chief and Assistant Chief Fire Officers’ Association (CACFOA) spoke about concerns unequivocally in his presidential address to the national fire conference in 1995:

Our management has been notable in attracting praise from others in its commitment to delivering service which meet and exceed the expectations of all three of the great ‘Es’ of the nineties’ culture—economy, effectiveness and efficiency.... History may well recall that we are not in an age of reason but in a decade of statistics. Statistics which strip naked the body of the service which is clothed in quality, reasoned managerial professional judgement and elected local councillors.... The accountants have the.... ability, if allowed to operate in isolation, to replace managerial freedom and sensible professional decisions with nonsensical arguments devoid of any human face. Minimal standards of fire cover are quickly becoming the maximum.... This is fast becoming a reality with people trying to measure quality (Davis 1995: 5, quoted in Stirling and Fitzgerald, 1997: 22).

This passage from his keynote address demonstrates a senior level commitment to a definition of what was termed a custodial approach to modernisation in Chapter 4 and how this might contradict other fire service actors’ definitions and visions (see Du Gay, 2005). It is well documented within the fire service that pressures to restructure are mediated by long-standing interests within the fire service, historically institutionalised assumptions and organisational practices. In the critical approach adopted by the President of the CACFOA, fire service actors either approve or disapprove of changes. Such an approach is a workable response to the extent that there are clear-cut positions that can be easily contrasted. The transformation of the VMDS (cf., its associations of a tool supporting fire crews at incidents) into a device that is simultaneously aligned with measuring fire crew performance, which is considered a core part of fire service modernisation, and with institutionalised practices, presages a different approach to the President’s scathing appraisal. It is an approach that assumes that technologies such as the VMDS are multiplicities that are significant actors in the future provision of fire services and as such

can be deployed in ways which the notion of technology as tool fails to capture in an adequate sense. The VMDS can be seen as a tool for reinforcing the power of institutionalised practices so long as it is remembered that institutionalised practices equally become a tool for extending the power of the VMDS.

7.4 From Universal Access to Global Crewing

The VMDS is not a simple cause of change at Hereford and Worcester Fire Brigade. Fire crews, station commanders and senior officers similarly did not portray the VMDS as causing the new practice of firefighter mobility in space and time which the brigade term 'global crewing'. Rather the 'force' of VMDS is as an initiative that is related to the local mobilisation of its effects. Technologies are, however, often delegated the role of reconstructing organisational order (see, for example, Latour, 1992): the VMDS is similarly constitutive of the problematic of providing fire services that includes boundaries and relations between firefighting practices; community safety; risk management; best value indicators; auditing activity; collective agreements; and, national standards of fire cover. This section sets out how the VMDS became a device that is associated with managing crew levels as well as providing a new practice for managing information. It examines how the VMDS is deployed to bring about changes in organisational practices and how the delegation to technology makes other changes less visible, at least within the brigade. This relation of visible/invisible is, however, a fragile effect that is sustained only in as much as the VMDS is mobilised as a device to improve fire crews' effectiveness and firefighters are enrolled in global crewing. This section also examines how VMDS-mediated mobility constitutes new arrangements of spatial and temporal ordering and disordering as it is translated into an affordance for firefighter mobility.⁵⁴

⁵⁴ For Law (1994) the question in social science is ordering and disordering whilst others argue that the notion of disorder makes little analytical sense (see, for example, Tsoukas, 1998: 292). For Tsoukas disorder is

The previous chapter set out how the VMDS was associated with a solution to the failure to provide information to fire crews. The VMDS, as suggested above, is distinct but inclusive of the solution to the management of fire crew levels through global crewing. Global crewing was introduced in early 1997 some months after the introduction of the VMDS in March 1996⁵⁵ and comprises coordination of day-to-day watch crew levels (e.g., leave, cover for training, etc.) at a central brigade level, with the officer in charge of global crewing based at the Operational Intelligence Unit. It is a version of 'variable crewing' that is discussed in the Audit Commission's (1995: 37) national review. The sub-officer responsible for the management of global crewing described its origins in the following terms:

Originally we started out having all the crews managed by the watch commanders on each station; they used to talk to eventually other stations if they were short [of firefighters]; we had an influx of new officers and we actually came to the conclusion, actually it came to light we were so short of people that we couldn't afford to have off on the leave the amount of people that we did so they had to come up with some way of actually governing the leave and using our crews to the best ability we could.⁵⁶

Before the VMDS was implemented, firefighters were allotted to a particular watch at a station, and each station had a designated 'turn-out' boundary/area (i.e., distinct spatial and temporal arrangements centred around station boundaries, local watch discipline, and situated knowledge of risks and geography). The turn-out area is the geographical boundary of station and watch responsibility based upon national fire cover categories and local legacies of fire cover at particular stations. Prior to global crewing station officers were responsible for ensuring watch crew levels were maintained to national standards and

undesirable organisation or a competing form of ordering. This is useful in foregrounding for whom order serves the wrong purposes, recovering marginalised accounts and examining how definitions of order and disorder are observer dependent. However, the assumption that disordering is a competing form of ordering/organising gives too much to order and stability.

⁵⁵ At the same time as new levels of fire cover were introduced within the brigade. See section 7.5.

⁵⁶ For example, the minimum number of firefighters Hereford and Worcester Fire Brigade require during the day duty is 58 according the sub-officer in charge of global crewing, who states that 'any more than that I can turn round and say, yeah, okay, we've got 63 on duty you stand a good chance of getting a day off, occasionally I'll stick my neck out and say yeah alright, you know'.

arrangements for detached duties (i.e., move to another station for a duty) were coordinated between station officers/commanders. Stations officers told me, for example, that fire crews would routinely respond to the needs of other stations for fire cover at the start of a duty/shift. According to an assistant divisional officer at the headquarters, when firefighters crewed the same watch at the same station, nationally negotiated working practices and station-based information infrastructures worked relatively effectively. Even though station-based coordination was subject to various forms of disordering and lack of central coordination, this form of coordination was associated with providing a workable practice until early 1997 when global crewing problematised the previous practice. The sub-officer for global crewing describes the problem of station management of appliances in terms of a lack of brigade level control and coordination:

the problems there at establishment [stations] level ... were being hidden by stations, [they] were talking to each other but it wasn't becoming apparent throughout the brigade, you hadn't got an overall view of it.

During the 1990s attending incidents outside of the turn-out boundaries became visible in two ways at Hereford and Worcester Fire Brigade. The first was the deaths of two firefighters at the fire at Sun Valley in 1993 outside their turn-out boundary (see Chapter 6). The second related to the provision of fire cover to neighbouring stations within the brigade. Although the provision of fire cover by neighbouring stations was, as mentioned above, a workable station-centred practice it did have effects on the brigade's performance against national attendance times (see Table 5, Appendix 2) particularly at Hereford and Worcester Fire Brigade, which is a semi-rural brigade, with fire crews attending incidents at some distance from their allocated, base station. Before global mobility was introduced there were, as mentioned above, few brigade-level practices for knowing which stations had fire crews which were ready to mobilise in order to meet national attendance times. The Audit Commission's report (1995: 32-33) describes this as operational/tactical management concern across UK fire services:

At the start of a shift, gaps in staffing are normally identified by watch or station commanders. Where watches fall below the numbers required to achieve minimum staffing, there will be some tactical movements of staff between those stations with more than the minimum and those with less, so that all appliances will have at least the minimum number of crew (usually four). *The main problem caused by having to fill absences in this way is that there can be a delay in a brigade having all its appliances operational.* This can be a particular problem in the evening, as the 6pm shift coincides with the busiest period for incidents (Management Handbook, emphasis added).

With global mobility, supported by universal access and status updates through the VMDS, firefighters would no longer be in the wrong place (because turn-out boundaries became less relevant for firefighters) at the wrong time (central coordination of global crewing would enable more effective management of fire crews before incident occurred) because global crewing is associated with ensuring that all appliances are ready to be mobilised before a shift starts. The officer in charge of managing the global crewing system, who is based at the Operational Intelligence Unit, describes how global crewing was not determined by the VMDS but nonetheless the VMDS is distinct but inclusive (Law 2000) of global crewing:

Researcher: So that a junior officer from Worcester could possibly be leading an incident in Kidderminster?

Sub-Officer: Yeah. That's where the VMDS system comes in. Because you can type in any—all this information [is] there for them.

Researcher: Yeah, because I suppose historically you only knew your patch [turn out area]?

Sub-officer: Yeah, right, yeah.

Researcher: Obviously there isn't a patch now I appreciate that.

Sub-officer: Well, they still do have patches, yeah. But you can go through the VMDS and pull out anything for any station so in theory if you wanted to you could pull up any risk, hunt for—enter for water supplies ... if fact we have had it where we have had a station with just one firefighter on there who is normally at that station and we've four people in.

Researcher: Right.

Sub-officer: Any information they need on the risks are on the computer. We do try and keep somebody who knows the area.

Here the VMDS is part of attempts at Hereford and Worcester Fire Brigade to construct chains of mobile interactions at brigade rather than station level, contextualised by wider demands to provide detailed procedural and output-focused performance measures that are

used to compare brigades. The previous chapter argued that the VMDS was accompanied by a centralisation of information collection and coordination. Heim (1991) argues, for example, that information and communication technologies are evocative of attempts to maintain, recover or extend what are understood as eternal truths against fragile human experience: the universal access that the VMDS provides can be understood as the integration and embodiment of previously disparate and incompatible information sources into a coherent, unified and transparent technological system. Porter (1995) terms this focus on unchanging truths ‘absolute objectivity’. This absolute objectivity in terms of the VMDS centres upon the introduction of centralised coordination and hierarchical authority to ensure the integrity of information held on the VMDS. Yet almost without exception all brigade personnel explicitly or implicitly articulated that the information held on the VMDS required some kind of contextual interpretation to be useful at incidents. In this sense the procedures and forms of coordination that are associated with the Operational Intelligence Unit, combined with local interpretation of information, can be understood by what Porter terms ‘mechanical objectivity’.⁵⁷ This denotes the routine compliance to impersonal procedures and calculations—termed ‘technologies of distance’ by Porter (1995)—that ensure that biases and distorting influences of particularistic interests are removed or held in check. Given the emphasis upon brigade-centric arrangements, mechanical objectivity at Hereford and Worcester Fire Brigade is best expressed as ‘internal objectivity’.

In addition to performance measurement through attendance times another indicator of the performance of brigades is ‘confidence levels’ or ‘ridership levels’. This performance

⁵⁷ For Porter (1995) the adoption of standardised procedures and formalised rules that he describes as ‘mechanical objectivity’ owe more to the attempts by professional groups (e.g., actuaries, accountants, and so forth) to negotiate a space for self-regulation against external demands for accountability than social practices adopting scientific practices. Absolute objectivity is premised upon the assumption that the social follows the scientific in discovering unchanging truths, with the assumption that positivist scientific inquiry is the model of social science.

indicator measures the number of firefighters on appliances in relation to national minimum levels. At the time the research was undertaken the national minimum 'confidence level' was five crew members. Yearly and comparative figures for confidence levels were not, however, widely disseminated at Hereford and Worcester Fire Brigade or in national performance reports. For example, the 'Performance Standards' report (e.g., Hereford and Worcester Fire Brigade, 1998: 9) mentions this specific measure but only reports detailed figures for response times for risk categories A to D together with other operational statistics and performance indicators.

The previous section described the Audit Commission's (1995) position on measures for attendance times and confidence levels. The report suggested that attendance times/confidence levels should become less important over time as there is a shift to BVPIs that emphasise a range of outcomes. Similarly the Independent Review of the Fire Service (Bain et al., 2002) only briefly mentions confidence levels in the provision of fire crews and connects national standards for confidence levels to inflexibility. Despite this, long-standing performance indicators, particularly attendance times, remain very important for fire brigades, in part because they remain a basis for comparing brigades. For example, Davis (1996: 39), the former President of the CACFOA, describes the effects of brigades' preoccupation with attendance times (and the relative neglect of confidence levels) for the general provision of fire services:

Performance to minimum standards, in our case the speed of our attendance to defined risk categories, has however progressively become the acceptable quality standard, yet in fire service terms achieving a fast arrival is just the beginning of our task. I ask you to question the real value of the fast arrival of an ill equipped and ill trained fire crew?'⁵⁸

⁵⁸ Davis (1996: 39) continues that the 'absolute need' for a fast response/attendance times places demands upon fire services to switch resources, with all the long-term consequences. This includes switching resources from firefighter and officer training programmes, deferring the replacement of fire appliances, putting off the purchase of fire and rescue equipment and reducing the resources to fire safety initiatives.

The availability of Hereford and Worcester Fire Brigade's confidence/ridership levels had been below the national average since the mid-1990s and had been worsening whilst attendance times had begun to improve. Hereford and Worcester Fire Brigade improved its performance on the percentage of incidents crewed by national standards of fire cover for attendance times (over 97 per cent in 2001-2), but the report continues:

[T]his performance is only being achieved as a result of wholetime shift personnel from primary crewed aerial or emergency tender/special appliances moving to crew pumping appliances during periods of insufficient riders (HMFSI Report, Hereford and Worcester Fire Brigade, 2002: 12).⁵⁹

The Inspectorate Report also stated that the

exceptionally low wholetime shift availability levels [confidence level] still cause concern [and] has an impact on service.... The percentage of shifts when wholetime appliances were crewed in accordance with Brigade policy has reduced from 60.3 per cent in 1999-2000 to 42.4 per cent in 2000-2001.... this downward trend has continued with provisional performance of 27.5 per cent being reported for 2001-2002 (HMFSI Report, Hereford and Worcester Fire Brigade, 2002: 3, 10-11).

The delegation of order to the VMDS-mediated global mobility reduced local flexibility in terms of the mobilisation of specialist fire crews and increased, according to many watches, the operational risks to wholetime and retained firefighters.⁶⁰ In addition to the ramifications of the dispersion across space of firefighters associated with global mobility there is also a temporal fragmentation with part-time/retained crews undertaking specialist roles previously allotted to wholetime watches. This has particular effects at Hereford and Worcester Fire Brigade which is comprised of significant areas of risk cover D and remote rural categories but also comprises of busy motorways to which it provides road accident services. In 1996-97, for example, 537 road traffic accidents were attended (with 504 in

⁵⁹ The temporal effects of technologically-mediated mobility in which firefighters are taken from emergency special appliances and relocated to primary appliances remains a problem at Hereford and Worcester Fire Brigade: 'The Emergency tenders are often not available on a primary crewed basis, as personnel have to be detached to crew pumping appliances at other Fire Stations' (Appendix H, Best Value Performance Plan, 2003-4).

⁶⁰ Global mobility meant that individual firefighters were increasingly spatially dispersed and firefighters' mobility was centrally coordinated and monitored. This had implications for station discipline, where order had been previously delegated to station architectures and wholetime watch practices. Station officers and watch commanders were less able to coordinate and monitor watches and this enacted a spatial dispersion of wholetime firefighters throughout Hereford and Worcester Fire Brigade.

1995-96), with 15.4 per cent of these requiring emergency special services to rescue people or animals (Performance Standards, The Grapevine, 1998: 11). The Best Value Performance Plan for 2003-4 states that one of the effects of this is that:

The current provision and delivery of rescue services at road accidents and other non-statutory emergencies are often dependent upon the attendance of one of the specialist primary crewed, emergency tenders... There are timeliness issues in managing this 'golden hour' with regard to the attendance of these vehicles at emergency incidents due to extended travel distances. Equipment from these vehicles is only deployed on about one in four of the occasions that they are mobilised (Appendix H, Best Value Performance Plan, 2003/4).

The report concludes that this is 'likely to place the Brigade almost if not bottom of the national performance table' (2002: 11).⁶¹ Hereford and Worcester Fire Brigade's Best Value Performance Plan for 2003-4, which comprised of review of the brigade's activities in 2002-3, describes how confidence levels remain a significant operational and human resource problem for the brigade.⁶²

We consistently achieve very good performance outcomes associated with national attendance standards for firefighters and fire appliances in response to emergency incidents.... On resourcing we need to tackle the issue of ridership [confidence] levels through better attendance management. We need to consider the changing role of our staff to reflect this within the recruitment process (Appendix H, Best Value Performance Plan, 2003-4).⁶³

Meeting national attendance standards for wholetime crew levels is only achievable by taking firefighters from other stations, and particularly from specialist appliances, which reduces confidence/ridership levels. This means that specialist equipment used for major and prolonged incidents (such as, for instance, Sun Valley but also road traffic accidents) are increasingly crewed by less experienced, retained crews acting as specialist backups to

⁶¹ The best value review continues that in relation to confidence levels, Hereford and Worcester Fire Brigade is near the bottom of the national performance figures: 'Our performance in relation to standards associated with availability of operational personnel at the start of the shift is poor. We are currently in the bottom quartile of Brigades in England and Wales' (Appendix H, Best Value Performance Plan, 2003-4). The figures for confidence levels are taken from the brigade's performance in 2002-3, a number of years after the primary research was undertaken.

⁶² The review does not, however, situate this against low confidence levels dating back to the late-1990s.

⁶³ Recommendation 3 in Appendix I of the 2003-4 Best Value Performance Plan states that there needs to be urgent action to 'address deficiencies in the approved establishment of wholetime firefighters in order to bring about an improvement in crewing levels of wholetime appliances'.

wholetime firefighters. This has temporal effects in terms of the boundaries between wholetime and retained firefighters with retained firefighters making up the numbers on specialist appliances. The delegation to a technologically mediated mobility has, in other words, constituted disordering effects that the VMDS was introduced to overcome, that is, wholetime firefighters being out of place (i.e., different stations) and out of time (i.e., waiting for specialist back-up from retained crews) at major incidents.

The distribution of ordering and disordering in relation to global crewing is nonetheless uneven with differential effects on the larger and smaller stations and first-tier level firefighters. For example, firefighters are usually moved from the larger stations because they are associated with having a greater 'pool of firefighters'. This is where, for instance, specialist appliances are located and specialist appliances are regularly taken as the 'pool' from which firefighters are moved to another station:

Sub-officer: They [larger stations] are used more for pool resources.

Researcher: Yeah, okay.

Sub-officer: And they are complaining that they are used as a pool but they've got more personnel so they—also we've got special appliances which we'll knock off the road first if we're really short.

For smaller stations, with one wholetime crew, one of the effects of global crewing is that it is easier to arrange leave than the previous station-based practice because this form of brigade-level mobility means that firefighters from across the brigade can cover for any other firefighter:

I would say nine out of ten are firefighters moving about. Occasionally you get junior officers but nowhere near as often as the firefighters.... They [smaller stations] are actually more [flexible] they can get their leave in a lot easier than if we had a different system (sub-officer, global crewing).

The sub-officer also described how global crewing is centred upon moving entry-level firefighters who have over a year's experience. This often means that an experienced firefighter can be promoted to a leading firefighter or sub-officer for a particular duty even

if the firefighter is not usually that rank. In addition to this temporary increase in status, there are also financial costs associated with global crewing in terms of extra remuneration for wholetime and retained fire crews and the employment of one sub-officer full-time to coordinate fire crew mobility. Wholetime firefighters are, for instance, paid overtime and travel/other expenses when they move to another station. The sub-officer in charge of global crewing describes the cost-benefit analysis that was undertaken because the chief fire officer 'was getting moans from the stations':

If someone leaves [for a duty at another station] before 9 o'clock to get to another station they get paid overtime [plus transport costs].... They can claim for their lunch as well, all those sort of things. We actually sat down and worked out what it cost over an 18 week period and tried to translate it into 52 weeks and it worked out less than the cost of employing two firemen in terms of pay ... if you employ those two firefighters you couldn't necessarily have them in the right place.

Retained crews are similarly remunerated with part-time firefighters receiving a payment on each occasion they are mobilised. The mobilisation of retained crews has increased at least in some stations since global crewing was introduced, as a senior officer at the brigade describes:

I mean the signs have been there for donkeys where arson is committed... every time you send an appliance out it costs money particularly with part-time [retained] firefighters you have to pay them every time they come to the station [even] for a false alarm because it means involving apparatus, seeing where everything is (divisional officer, brigade headquarters).

The extra remuneration for wholetime firefighters is an important part of the enrolment of individual firefighters as it provides extra income above the national levels in the Grey Book for particular firefighter grades. This additional remuneration is not only a financial incentive but, as suggested in Chapter 4, Section 4.9, is consistent with the assumption that collectively agreed terms and conditions are minimum level terms and conditions. Extra remuneration from global crewing is, then, consistent with legacies dating back to the county reorganisation in 1974 when brigades' internal arrangements were commonly above the Grey Book level. In addition, although global crewing is a new form of mobility for

firefighters and a local managerial initiative, it is a form of mobility that is nonetheless consistent with existing collective agreements and standards at a national level: it is a supplement rather than an overturning of national assumptions of fire crews organised around watches at stations and national standards for attendance time.

There are three general points that can be extracted from the above examination of global crewing and the VMDS. The first is that confidence/ridership levels in 2002-3 are commensurate with those of the mid- to late-1990s, demonstrating consistent low confidence/ridership levels over a number of years. This level of performance remains possible in part because of the financial, developmental and flexibility opportunities the VMDS affords some firefighters and fire crews. The second point is that the BV Performance Plan does not discuss the risks to firefighters of low confidence levels. At Hereford and Worcester Fire Brigade confidence levels are less important than attendance times, and the emphasis upon attendance times at the brigade can be understood as an attempt to construct a way through competing performance indicators so as to sustain the brigade's position vis-à-vis the performance of other brigades. The third point relates to how the VMDS is associated with, and afforded, the implementation of global crewing because of the universal access to information. It was argued in Chapter 6 that the VMDS was associated with a new vision of fire service provision—one which is centred upon management through information. Organising through 'internal objectivity' becomes a means of mobilising the VMDS into a technological device that is bound up with the deferral of low confidence levels in the mid- to late-1990s into efficiency improvements that will accrue in the future from increasingly effective global crewing management. This deferral is a fragile postponement, however, with external Fire Service Inspectorate reports making low confidence an issue that Hereford and Worcester Fire Brigade must respond to.

The conclusion from this is not that officers and fire crews at Hereford and Worcester Fire Brigade have been cynically fooled by promises of the VMDS-mediated mobility and the internal objectivity it affords but rather that technological innovations can be enrolled, at least temporally, in ameliorating tensions relating to difficult and/or intractable organisational issues. At Hereford and Worcester Fire Brigade the organisational problem with confidence levels has arisen in part because of a lack of front-line firefighters. This has occurred because firefighters have been promoted to replace early officers retiring; recruitment problems for entry-level firefighters; long-term injury and sickness leave; and absenteeism and stress levels. For the purpose of this section these important organisational issues are not examined in detail. The important point here is the contention that as confidence levels become thinkable in terms of a VMDS solution other aspects of watch duty planning and organisation are less visible.

The VMDS also contributes to the deferral of the wider problematic of the provision of fire services. This includes the topping-up central of government funding by local authorities (see Chapter 4, Section 4.7) and the lack of central government funding for a major reorganisation of the fire service, including provision for the significantly rising cost of funding the firefighters' pension scheme and the cost of long-term sickness; firefighter and officer training programmes; the replacement of fire appliances; and resources for community fire safety programmes. On the preoccupation with funding, the former President of the CACFOA stated that the fire service has a need for 'technical development to meet more complex hazards with better information systems and personal protection, [but] is short of basic capital funding' (Davis, 1996: 39). The negotiation of central funding via the SSA (Chapter 4, Section 4.6) and the legacy but uncertain future of local authority top-ups, provides ongoing ambiguity for the brigade's provision of fire services, particularly with little evidence that major reorganisation (e.g., towards community fire

safety) of fire services, which is likely to require sustained financing over time, will accrue the level of funding many within the fire service suggest is required for modernisation. The pinning of hopes to the power of technological devices becomes particularly potent in such contexts.

7.5 From Universal Access to Mobility ‘On the Run’

It has been discussed in Chapters 4 and 6 that the introduction of the VMDS has become part of attempts to respond to a wider problematic and historical ambition to modernise and streamline the provision of UK fire services: the function of the VMDS is constituted through the ongoing elaboration of visions of fire service provision. A central part of the vision of fire service provision in recent government reviews (see Chapter 4, Sections 4.7 and 4.8) is the need for improved managerial competencies and greater fire crew flexibility (i.e., part-time firefighters, increased movement of firefighters between watches, mobile fire appliances, etc.).

The previous section set out how the VMDS was transformed into a device that supported global mobility whilst simultaneously deferring organisational issues relating to, for instance, the retention of officers, recruitment and long-term funding arrangements. This section describes an attempt to mobilise the VMDS as a device that can bring about a further significant change of the brigade’s working practices, but which, at the time the research was conducted, was not introduced. This failed or inconsistent translation demonstrates the limits of transversal movement associated with the VMDS.

In addition to the alignment of the VMDS for status messages/updates and global crewing, the external consultant from Joyce-Loebl was responsible for working with the brigade described how the connection between the VMDS and the command and control centre meant that a fire appliance could be mobilised (e.g., OS grid reference for the incident, and

transmission of the risk record number) without fire crews needing to be located at a station. Fire crews could, in other words, be located anywhere within the brigade's geographical area of jurisdiction and, in addition, moved to different locations at different times of the day in conjunction with assessments of changes in the level and location of risk over the course of a day. This is what is termed 'mobility on the run': the location of fire appliances at different places at different times of the day (e.g., near business districts during daytime working hours and residential areas in the evening) forms an important part of the recommendations of the last two national reviews of fire service provision (Audit Commission, 1995; Bain et al., 2002). For instance, the Audit Commission's (1995: 49-50) report states that:

The key to deciding the number and location of operational resources is risk categorisation, which determines the location and staffing of stations and pumps.... Brigades should ensure that they review these situations carefully to assess accurately both the level of risk and the cost associated with providing different levels of cover. Whilst the national standards need to be reviewed to make brigades' flexibility in such cases more explicit, failure to evaluate such instances will allow fire cover provision to become out of step with actual risk.

The consultant from Joyce-Loebl describes the implications for the brigade practices of the connection of the VMDS to the command and control centre and connects this to new ways of managing:

[I]f data bursts could be transmitted from the vehicle to the command and control system then short data bursts could be sent in the reverse direction. For instance, it would be possible to mobilise a particular vehicle whether static at a fire station or "on the run" returning from an incident.... Thus, it would be possible for the information to be ready and immediately available to the officer in charge of a *mobilised vehicle*' (Humphreys, 1997: 41, emphasis added).

Prior to the VMDS, the addition of GPS and the data relay connection to the command and control centre, fire appliances could be mobilised to other incidents whilst they were not at a station but this required the control centre staff to radio the fire crew to ascertain their exact location then decide which appliance to mobilise. Here changes to the pre-existing organisational practice, which is based upon fire crews attending an incident and then

returning to their home station, is delegated to the technological capability to mobilise fire crews 'on the run' instead of, for instance, modernisation of working practices by national fire service reviews (for example, Bain et al., 2002). Mobility 'on the run', however, constitutes a shift to what Bain et al. (2002: 39) term a risk based approach (see also Chapter 8, Section 8.4) to the deployment of fire crews (see also Davis, 1997). With this approach, premised upon the assumption that 'risks move with people', the level of fire cover allocated to localities (i.e., industrial/business, urban and suburban) would change over a 24-hour period (see also Chapter 4, Section 4.8). For the Audit Commission (1995: 31) this also includes potential changes to the level of crewing:

There would, therefore, appear to be grounds for reconsidering the appliances and the number of firefighters required to operate safely and effectively at a fire.... [including] whether many fires would be better dealt with by sending one appliance with a crew of six [instead of a crew of five] rather than by sending two appliances arriving one after the other with a total crew of nine.

During the period the research was conducted moving fire crews to different locations during the course of a shift was, however, considered unworkable by the brigade. This contrasts with the introduction of global crewing described in the previous section. Global crewing/mobility was, however, not introduced at Hereford and Worcester Fire Brigade because the VMDS determined the social organisation of fire crews. Rather global mobility was aligned with long-standing working conditions and did not challenge the primacy of station-based watches, even if the individual make-up of watches changed; nor did global mobility question the premise that watches should be located at stations.

The previous sections examined how the brigade's organisational practices were aligned with status messages/updates and global mobility. Mobility 'on the run' is, however, not sustainable, at least during the period of research, because it is circumscribed by collective national agreements that state that the level of fire cover must be constant throughout a 24-hour period. Changing the level of cover during the course of a day would constitute

renegotiating the assumptions of risk cover that date back to the mid-1930s and were updated in the mid-1980s, but also represent at least a partial undoing of collectively negotiated national standards. The premise that fire cover is constant throughout day and night shifts (for example, the number and location of fire appliances and numbers that comprise a fire crew) is currently a critical assumption of fire service provision and this becomes even more symbolic of what is at stake with the modernisation of fire service provision, particularly with the recommendations for risk-based approach based upon cost-benefit analyses and demands to reduce the costs of providing fire services from national reviews.

As resources become increasingly constrained, however, it will become more difficult to respond to areas of greater need without reallocating resources from areas where the actual need is not as great as the existing risk categorisation suggests.... Greater discretion should be allowed to fire authorities to deviate from the existing standards of fire cover. This would include the flexibility to provide cover at marginally below the standards if it could be shown that the resources this freed could be used to achieve a greater reduction in loss of life or property elsewhere within the brigade area (Audit Commission, 1995: 32-35).

The study group which researched the Audit Commission's review in the mid-1990s stated that 'the study team was told of a number of instances where stations could have their crewing system changed to a less expensive arrangement or a station could be closed while still meeting the standards of fire cover' (Audit Commission, 1995: 50).

The counter-posing of the VMDS in terms of 'global crewing' against mobility 'on the run' demonstrates that the limits of what can be deferred to the technological at a particular point in time is relational and as such bound up with the non-technological. It was argued in the previous chapter that the non-discursive and the discursive are the interdependent limit and support of each other. VMDS screens afford universal access to information and a standardised medium for the communication of status updates. Global crewing is a local managerial initiative whilst 'mobility on the run' challenges long-standing fire service practices including national standards of fire cover, station-based mobilisation, daily

training sessions and routine maintenance of equipment.⁶⁴ This does not mean, however, that mobility on the run would be unsustainable at some point in the future if actors' interests are mobilised in ways that align the future of the fire service with this form of mobility (see also Chapter 8). For the purposes of this chapter, however, this failed transversal movement demonstrates that the VMDS is not merely a completely neutral tool that can be implemented to any end. The VMDS at Hereford and Worcester Fire Brigade can instead be analysed through the way it becomes part of the general problematic of organising fire services through its relational contextualisation and decontextualisation—its shimmering universal presence on the dashboard of each of Hereford and Worcester Fire Brigade's fire appliances. Screwed to the dashboard, VMDS screens, with universal access encased in clean hard lines of stainless steel, are suggestive of a contemporary innovation (see also Chapter 8, Section 8.2). Universal access via easy-to-use screens evokes the problematic of the future role of local practices, the legacy of national standards and the relationship with neighbouring brigades and other emergency services.

7.6 Concluding Remarks

This chapter has examined three translations associated with the VMDS: from the initial implementation of the VMDS in early 1996, the VMDS was aligned as consistent with status messaging/performance measures, as distinct but inclusive of global crewing and inconsistent with mobility 'on the run'. These translations suggest that the VMDS is a multiple object that is a both/and of information access, status updates, global crewing but not mobility on the run, rather than one or the other of these objects. The VMDS is more than one object but VMDS effects are not merely arbitrary. The multiple effects associated with the VMDS are brought about by translations that align, delegate and connect and it is

⁶⁴ Fire crews described other ordering and disordering effects of mobility 'on the run' including coordination of global crewing firefighters; the provision of toilet facilities for fire crews outside of stations; arrangements and places for breaks.

these transversal movements that mark out the multiplicity of the VMDS as particular mixtures of Deleuze's modes of reality—possible-real and virtual-actual.

The VMDS is an object that changes as it traverses different spaces and times but it also performs connections, alignments and displacements that brings about changes as it is translated. The VMDS is a multiple object that is constitutive of the problematic of fire service provision: the VMDS is a technological infrastructure for fire services across the UK, but it is also an unmistakably brigade-centred device for Hereford and Worcester Fire Brigade. In other words, the translations described in this chapter suggest that there is no clear-cut boundary between the content of the VMDS and Hereford and Worcester Fire Brigade's structures, practices and routines. Different contextualisations are contained and enacted in translating the VMDS. Understood in this way, the context and the VMDS are multiple: the content of the VMDS and the context not only make a mutual impression on each other but are constitutive of one another.

The VMDS, aligned initially with a vision of ICT-mediated fire service provision based upon 'universal access', becomes mobilised for status updates and new forms of crew mobility, and in this way the VMDS breaks away from a contextualisation as a front-line incident management to a device for instantiating a technologically-based brigade-centred form of modernisation. The VMDS does not, then, work within a context but is constitutive of enacting—of speaking for—the context of fire service provision. Even when an attempted translation of the VMDS does not occur (as in the third, trial translation to mobility 'on the run') because it is taken as a translation that is 'out of context', the VMDS and the context remain constitutively connected. Failed translations mark out the boundaries of the capacities of the VMDS as much as successful translations, and the attempted contextualisation, in this instance of an approach to risk management comprised

of variable crew location, is posited as beyond the impact of the current technological innovation, at least at the time the research was conducted.

De Laet and Mol (2000: 225, emphasis in original) examine the use of a community bush pump in rural Zimbabwe and similarly conclude that the pump is a multiple object that does many things:

Zimbabwe Bush Pump is solid and mechanical and yet ... its *boundaries* are vague and moving, rather than being clear and fixed. Likewise the question as to whether or not the Bush Pump actually *works*, as technologies are supposed to, can only rarely to be answered with a clear-cut 'yes' or 'no'. Instead, there are many grades and shades of 'working'; there are adaptations and variants. Thus the fluidity of the pump's working order is not a matter of interpretation. It is built into the technology itself.⁶⁵

The translations or transversal movements examined in this and the previous chapter suggest a nuanced approach to understanding the 'workability' of ICTs. The VMDS was implemented to provide a solution to the lack of timely information yet the VMDS was not used on an everyday basis by fire crews attending incidents. Does this make the VMDS a success or failure? Is 'success' or 'failure' the right question? 'Successful' mobilisation of the VMDS for status updates/performance measures and global crewing and the 'failed' enrolment of the VMDS for mobility 'on the run' demonstrate that, firstly, the VMDS is part of ongoing translation/transformation, and, secondly, success and failure must be analysed as part of the multiple, relational effects associated with the VMDS. The VMDS might 'work' for global mobility for a period of time but not for status updates or it might provide access to information but not flexibility in the deployment of fire crews. De Laet and Mol's normative conclusion is that 'good technologies' may be those which

⁶⁵ In assessing the capacities of technical objects de Laet and Mol (2000: 255) continue that they are 'unwilling to reduce flexibility to interpretation' (cf., Star and Griesemer, 1989). This symmetrical approach to technology means that they focus upon actions, movements and effects rather than (human) intentions. This means that the Bush Pump 'is not quite a boundary object. A boundary object, a figure that features in symbolic-interactionist theory, moves between (social) worlds, in which it gets interpreted in different ways. While the object's boundaries remain firm, its "variability" is due entirely to the different ways in which it gets interpreted. Our notion of fluidity serves to flag the way in which object and world are *intertwined*; it points to the flexibility of the pump's definition and the variability of its perimeter, but also its capacity to shape "worlds"' (de Laet and Mol, 2000: 257).

incorporate the potentiality for their own breakdown and can be deployed in multiple ways. Holmström and Stalder (2001) arrive at a similar conclusion in their study of the introduction of electronic cash devices in Sweden. For a technology to be ‘successful’ it must ‘drift’ from a single purpose network centred around the interests of designers and implementers to become enmeshed with multi-purpose networks characterised by heterogeneous actors, purposes and effects. The VMDS may, similarly, continue to ‘work’ even after associations with information access, status updates and global crewing are distant memories.

There is a critical and creative conclusion that needs be drawn from this empirical study of a mobile incident management technology for a fire brigade (but also from studies of community water pumps in southern Africa, electronic cash in Scandinavia and technological innovations more generally). Deleuze’s (1994) four modes of reality constitute an explicitly politicised space in which the ontogenesis of an object is not only that effect of ideological and mystifying forces, although, no doubt, such forces will be encountered (see Tirardo et al., 1999), but a reanimation of the politics of objects, their associations, alignments and contextualisations. It is a call for engagement in ‘ontological politics’—what I term an ‘ontological turn’ for organisational analysis—that is developed in more detail in Chapter 9.

Chapter 8: Taming Fire with the VMDS

'Is a railroad local or global? Neither. It is local at all points, since you always find sleepers and railroad workers, and you have stations and automatic ticket machines scattered along the way. Yet it is global, since it takes you from Madrid to Berlin or from Brest to Vladivostock. However, it is not universal enough to be able to take you just anywhere.... There are continuous paths that lead from the local to the global, from the circumstantial to the universal, from the contingent to the necessary, only so long as the branch lines are paid for.... For ideas, knowledge, laws and skills, however, the model of the technological network seems inadequate.... The tracers become more difficult to follow, their cost is no longer so well documented, one risks losing sight of the bumpy path that leads from the local to the global'.

Bruno Latour, 'We Have Never Been Modern'.

Prometheus: I caused mortals no longer to foresee their own doom.

Chorus: Of what sort was the cure thou didst find for this affliction?

Prometheus: I caused blind hopes to dwell in their breasts.

Aeschylus, 'Prometheus Bound'.

8.1 Introduction

Pieter Bruegel de Elder's (1525-1569) famous oil paintings 'Tower of Babel' and 'Little Tower of Babel' were painted in 1563. Bruegel had visited Rome in the early 1560s and it is reputed that he based these paintings on the Coliseum. Both paintings depict a pyramid-type building surrounded by a multitude of human activity. For the purpose of situating this chapter's concerns, two dimensions of these paintings are of interest. The first is that it is uncertain whether the Towers are under construction or in an increasing state of ruin. Some parts of the Tower of Babel painting are, for example, incomplete either because they are unfinished or are collapsing. In the 'Little Tower of Babel' it is unclear whether the black cloud by the dark red building is climatic or the remnant of smoke from a burnt tower. These uncertainties presage something about buildings but also objects such as the VMDS: Bruegel's paintings depict an ambivalent relationship between humankind and the Tower of Babel. The second is that it is clear that human activity is centrally implicated in maintaining the power of or bringing about the downfall of these buildings even though this activity is depicted at the margins. It is, for instance, at the edge of the Babel paintings which teem with men, women and children, engaged in hunting, working animals, hay-making, resting and ploughing (some estimates suggest that there are more than seven thousand people in the Tower of Babel painting).

Aeschylus' 'Prometheus Bound' is interested in hopes and the future of humankind. In the myth of Prometheus (see also Chapter 1) the provider of the tool of fire to humankind, it is for placing hope in the breasts of humankind that Prometheus incurs Zeus' severest and pitiless wrath and is chained to a rock for infinity with an eagle devouring his immortal liver: for stealing fire, Zeus set Pandora onto the world, but for giving humankind hope Prometheus was made to suffer for eternity. Prometheus preserves the human spirit not only by providing fire as a tool for survival but by giving hope to humankind which, according

to Barney (2000: 5), makes humans ‘instrumental, hopeful beings who believe themselves to be free of limits [and] are dangerous to themselves and, ultimately, to their gods. Fire was a significant instrument, but without the added fuel of hope its flames could be contained’. With hope dwelling in their breasts the future is open-ended and humans create their own destiny.

This chapter is concerned with the ambivalences and the hopes associated with the VMDS. The chapter is organised in the following way. The next section examines how the broad appeal of the VMDS is constructed through various kinds of demonstrations. This includes external demonstrations at the ‘IT village’ at the national fire service conference and exhibition in 1997, and internal demonstrations by the Operational Intelligence Unit to fire crews. It is argued that external and internal demonstrations are focused on different audiences but both attempt to constitute the VMDS as a stand-alone device that does not require other practices to maintain its durability. These demonstrations are then contrasted with an examination of the situated effects of the VMDS, particularly spatial and temporal effects relating to fire crew coordination. Section 8.3 is concerned with how fire crews are enrolled and enrol other actors in the collective upkeep of the VMDS. It is argued that fire crews have an ambivalent relationship to the VMDS—they are simultaneously its publicists and detractors—and are involved in maintaining the durability of the VMDS. This is demonstrated through a discussion of firefighter and fire crew use (and non-use) of the VMDS and an examination of how and why fire crews help maintain the viability of the VMDS. Maintaining the workability of the VMDS is explained as ‘internal network building’ by fire crew, and it is suggested that there are various reasons for this including the broad promise of front-line incident information based around ICTs, and the alignment of the VMDS with existing working practices and employment conditions. Section 8.4 develops points made in the previous section concerning ambivalence and examines how

the VMDS becomes part of the general problematic of fire service provision at Hereford and Worcester Fire Brigade. For the purposes of this section, this comprises of changes in the brigade's status, a risk cover review and the redeployment of firefighters. It is suggested that the VMDS can be analysed as a resource for charting the contingent distribution and deferral of ambiguities and inconsistencies within the fire service. The VMDS is, for example, associated with the redistribution of tensions relating to the new brigade status and the emergence of risk management centred upon Tactical Information Plans held on the VMDS. The emphasis upon the management of risk by front-line crews using the VMDS constructs the VMDS as a potent force for firefighter-centred change to fire service provision. Together with the alignment of the VMDS with current working practices, screen-based Tactical Information Plans provide, it is argued, a competing vision to recent national reviews of the fire service. The final section of the chapter makes some concluding remarks.

8.2 Demonstrations and Making the 'Technological Watch' Work

Since the mid-1990s numerous fire brigades have introduced VMDS-type devices and many are reassessing the use of information and communication technologies for front-line incident management (see, for example, Fire Service Mobile Data Task Group, 2002). The VMDS is aligned with modernising fire services despite a lack of evidence that such technologies enhance fire crew effectiveness and despite a lack of emphasis upon ICTs in national reviews of the fire service over the last 20 years (see Chapter 4).

As part of the primary research I observed the VMDS demonstration stand at the 1997 fire service conference/exhibition/trade show in Bournemouth.⁶⁶ The joint Hereford and Worcester Fire Brigade/Joyce-Loebl stand, which was part of the first 'IT village' at the

⁶⁶ This conference/exhibition/trade show took place over two days, 13-14 September 1997.

exhibition, comprised of a number of suppliers of mobile data systems. It demonstrated how front-line information and communication technology was becoming more important in the debate about the modernisation of fire services. In addition, Hereford and Worcester Fire Brigade's presence at the IT village is an attempt to consolidate the role of a small, non-metropolitan brigade in the mobile data debate.

Demonstrations of the VMDS to delegates (including, for instance, senior fire service officers, central and local government representatives and trade union officials) attending the exhibition and conference were conducted by the assistant divisional officer responsible for the development of the VMDS at Hereford and Worcester Fire Brigade and a representative from Joyce-Loebl—the supplier of VMDS hardware and software.⁶⁷ During the time I observed the stand, demonstrations were popular and comprised of informal presentations of the VMDS with individuals standing round a mock-up VMDS screen, keyboard and printer. The VMDS was introduced by the assistant divisional officer as something that was already widely used at Hereford and Worcester Fire Brigade rather than something that was in development—as part of this a sense of a demand for the VMDS by firefighters was articulated by the officer. The assistant divisional officer nearly always referred to the robust stainless steel VMDS casing as important in fire crews' acceptance of the VMDS and this was contrasted with a rival handheld laptop VMDS, which was demonstrated on another stand within the IT village, which the officer and representative described in pejorative terms as 'not rugged enough' for the kind of work firefighters undertake. In addition, the assistant divisional officer described the 'full availability for the first time' of previously dispersed paper risk records and OS maps.

⁶⁷ The role of Joyce-Loebl in constructing the broad appeal—a high degree of externality—of the VMDS is not discussed in detail here. See, for example, Legge (2002) for an examination of consultants' activities that draws upon actor-network theory.

The presence of a VMDS on the stand was an important component in the potency of demonstrations and part of an attempt to make the VMDS speak for the future context of fire services provision. The main part of the demonstration was based around interaction with the VMDS with the emphasis upon showing the speed and simplicity of accessing information via the VMDS screen: the emphasis was upon technical capability defined in terms of the quick retrieval of information—Latour's (1999a) 'double click'. The officer stated that the VMDS had replaced the need to keep bulky 1.(1).D records in A4 folders in fire appliances—a record-keeping practice familiar to those associated with the fire service—and then explained how on mobilisation to an incident all the officer in charge/sub-officer, who sits in the front passenger seat, has to do is retrieve the appropriate information from the VMDS screen and then press 'print'. At this point in the demonstration the officer would usually press the print button on the keyboard, point to the screen and the printer would begin to print (the officer had usually arranged a risk record to be ready for printing between demonstrations). Before leaving the stand those interested were given a brochure with further information on the VMDS, Hereford and Worcester Fire Brigade and Joyce-Loebl.

VMDS demonstrations at the fire service exhibition follow the four stages that Bloomfield and Vurdubakis (2002) delineate are important in the construction of a technologically-mediated future in which ICTs deliver stand-alone access to information. Downey (1998: 1-57) also argues that demonstrations are constitutive in reinforcing powerful cultural assumptions of technoscientific progress. In terms of the VMDS the first stage is the new 'IT village' at the exhibition. The IT village can be understood as the beginning of a vision of a new community—an 'IT village' that questions existing assumptions—in the provision of fire services, one that is centred around information and communication technologies. The second stage is concerned with the presence of the VMDS as a material device placed

on a small, chest height podium. The gap between the imperfect present of paper-based records and maps and the future constructed around the vision of an ICT-based community is translated into a demonstration stand with a 'fully working' VMDS. Following Downey's sentiments, the presence of an artefact at a demonstration is, according to Bloomfield and Vurdubakis (2002: 121), an attempt at a 'material enactment of an absent "future" in which the visitor may be physically immersed.... They offer a glimpse of what the user could do in future if they purchased the full version'. Through the demonstration delegates at the exhibition not only interact with the VMDS but witness how the future of front-line incident management already exists in at least one UK fire brigade: the presence of the VMDS is taken as a faithful re-enactment of the reality of using the 36 VMDS at Hereford and Worcester Fire Brigade.⁶⁸ The formal demonstration was followed—the third stage—with delegates asking the assistant divisional officer and the company representative questions, and these often focused on either technical details or firefighter use of the VMDS. In the final, fourth stage delegates were offered more information on the VMDS from a joint Hereford and Worcester Fire Brigade/Joyce-Loebl brochure. Bloomfield and Vurdubakis (2002: 124) describe this as a 'return to the world of words and paper.... serving to make elements of the message portable while at the same time providing a reminder ... of what has happened'. It is through carefully choreographed activities such as those at the fire service exhibition that the VMDS is constructed as a working innovation ready to be implemented in any UK fire service.

In contrast to the demonstration at the exhibition that deployed the material presence of the VMDS to construct a powerful narrative of a technologically mediated future, internal VMDS-related presentations, which accompanied the introduction of the VMDS, emphasised the role of the Operational Intelligence Unit. Here an example of how the

⁶⁸ To the extent that risk records are located easily and printed quickly, the VMDS is reducible to hardware/software and a competent human operator.

VMDS was aligned with stand-alone/self-contained device—an innovation that does not require assistance from other brigade practices—was what I termed the ‘badger narrative’. The relevance of this account of use of the VMDS is that this helped afford the VMDS as a discrete entity outside of pre-existing practices and consolidated the role of the Operational Intelligence Unit as providing newly, standardised information to fire crews (see also Chapter 7).

Before the introduction of the VMDS firefighters did not have a comprehensive officers’ handbook to which they could readily refer. This changed with the VMDS and the introduction of an officers’ handbook held on the VMDS. Firefighters often related the ‘badger narrative’ when questioned about the on-line handbook: with the introduction of new guidelines for animal care and welfare, the officers’ handbook provided a step-by-step procedure for rescuing, in this instance, a trapped badger. Firefighters described how knowing how to rescue a protected animal is increasingly important although no firefighter could remember such an incident occurring. After a number of firefighters described a similar use for the VMDS I wondered how this narrative came to be mentioned by firefighters at different stations. It turned out that this was an example of using the VMDS that had been part of the Operational Intelligence Unit’s presentations to stations during the implementation of the VMDS. This repetition by firefighters could be dismissed as an easy answer to the questioning of an external researcher. Notwithstanding this, the important point for the purposes of this chapter is that VMDS is a technological device that maintains its rationale in part through the sense of introduction of new forms of knowledge (in this case of something that very rarely occurs and that is outside of firefighters’ everyday practice) and the standardisation of previous information management practices through the provision of an on-line officers’ handbook.

The IT village, formal demonstrations and internal, brigade presentations illustrate how a vision of information and communication technology-mediated incident management which attempts to constitute the VMDS as a stand-alone device is contextualised and decontextualised in different ways. Law (2002) describes stand-alone objects as ‘virtual objects’ (cf., Chapters 6 and 7). For Law (2002: 217) virtual objects are ‘objects that are projected as pre-existing behind the practices in which they are represented’—objects appear as something singular, integrated and unified and outside of practices and activities that constitute their effects. Elsewhere Law (1996: 298) suggests that it is the ‘realist performance of virtual objects’ which ‘is crucial for the creation of the subject/object distinction’. For those who research organisations the interesting question relating to this sense of a virtual object is how the practices that maintain the workability of an object are accounted for.

The external and internal VMDS demonstrations, Operational Intelligence Unit presentations and paper brochures are involved in framing the capacities of the VMDS around the retrieval of disembodied information. Demonstrations lacked detail, however, on situated VMDS-related practices. This lack of detail illustrates how practices that make the VMDS workable are marginalised. The situated and collective character of fire crews’ work was, however, made visible through informal demonstrations which firefighters were always willing to undertake although they were often unsure of their usefulness for research purposes.⁶⁹ Fire crews, for instance, regularly have to work around the VMDS in ways, which are invisible for the purposes of formal demonstrations. Use of the VMDS on the

⁶⁹ Researching fire crews’ use of the VMDS at stations provided more familiar insights to those used to researching workplace practices (e.g., Suchman, 1987) and take a variety of forms. Studies of workplace practice over the last two decades, inspired, in part, by ethnomethodological approaches, have demonstrated that individuals and groups work at ‘repairing’ organisational routines or technological devices as having their working lives determined by such rules and artefacts. For instance, in order for workplace activities to be completed efficiently actors routinely work around current limitations of technological devices. This may include correcting records without specific authorisation, temporarily making fictional entries in records so as to be able to proceed with a task, and, more generally, creative workplace activity to work around the limitations of a particular artefact (see for example Berg, 1997).

move and at night are examples of a lack of emphasis upon the minutiae of workplace practices. Officers described the great difficulty of using the VMDS on the move, particularly when moving through traffic as the fire appliance swerved, accelerated and slowed down: the VMDS has a relatively small keyboard and officers remarked that it is hard to navigate through screens without pressing a wrong button whilst on the move. Another fire crew described how they had placed a tea-towel over the screen of the VMDS because the light from the screen reflected into the driver's side mirrors. This meant that the VMDS are rarely used on the move—a point discussed in more detail in the following section.

The contingent durability of the VMDS was demonstrated late one evening after the fire crew had discharged their routine duties. I often asked firefighters to show me the features of the VMDS while sitting by the VMDS screen and whilst doing this, I asked, on this occasion, the leading firefighter at Bromsgrove if I could be shown the newly installed brigade mapping system, which provided detailed Ordnance Survey maps for Hereford and Worcester Fire Brigade's entire area of responsibility. Before OS mapping was installed on the VMDS, fire crews kept standard OS paper maps for the area surrounding the station and usually large-scale paper maps of the county. These paper maps were kept by the driver's seat and the maps were used by different members of the fire crew on the way to an incident depending upon the local knowledge of firefighters.

The rationale for the introduction of a VMDS-mediated mapping system was, as with the universal access to risk information, to provide each fire crew with access to information with which to navigate to any area within the brigade's county boundaries. I suggested that we should try to locate an industrial complex for which we had examined the risk records a few minutes earlier. The firefighter said this was a bad example as not only was this location at the other side of the county but the firefighter said he did not know that part of

the county very well. It was decided instead that we would look for a nearby factory. After several minutes of scrolling around the screen, zooming in and out of variously scaled maps and increasing frustration, the firefighter gave up on looking for the entrance to the factory (although the firefighter assured me he knew where it was). Whilst we were searching for the factory another firefighter had entered the fire appliance to see what was happening, and it was suggested we look for something on the VMDS for which the firefighters' knew the exact location. The three of us, hunched around the screen, resolved to locate the firefighter's house.

This also turned out to be difficult and time-consuming with the firefighter adding that the hydrants were positioned at the wrong location on the map. The three of us laughed at the irony of spending a considerable amount of time finding a building that a least one person knew very well and for which the fire crew would never use the VMDS—the firefighter was already an expert at getting home! This was, in addition, whilst the fire appliance was stationary in the forecourt of the station. The first task we had set ourselves, finding the factory, was too difficult because the firefighter had few other resources to draw upon. In this way not being able to locate the factory provided more information than being able to find the firefighter's house—the information that the mapping system is durable only inasmuch as the VMDS is used in conjunction with a range of other discursive and non-discursive resources. This included larger-scale paper maps used in conjunction with VMDS maps, firefighters sharing their knowledge of a geographical area within a fire crew and between crews via radio communication, and directional assistance from the command and control centre at brigade headquarters. Here in distinct contrast to the demonstrations at the exhibition in Bournemouth, the stability of the VMDS is not a matter of retrieving disembodied information from a screen but is a situated and collective practice (Brown and

Duguid, 1991) that is dependent upon an array of human and non-human actors that were not present in the cabin of the fire appliance that evening.⁷⁰

The VMDS also reconstructed fire crews' activities around two interdependent spatial/temporal VMDS effects that further demonstrated the invisibility of the situated and collective basis of crew coordination. The first effect relates to the consequences of the materialisation of the assumption that VMDS screens provide access to disembodied information. The VMDS reduced possibilities for fire crew coordination on the move and reorganised the informal division of labour while driving to an incident. Before the VMDS was introduced each fire crew had a formal and informal division of labour (i.e., one firefighter reading risk records, another locating water hydrants, another navigating, and so on) on the way to incidents. Firefighters were allocated roles but this did not mean that tasks were individualised. Rather interaction in the fire appliance often influenced the approach taken to managing an incident. Firefighters would also often take on tasks on the way to an incident even if the sub-officer did not allocate the particular task to the firefighter. The VMDS made this collective structure of interaction between firefighters much more difficult (but see Sections 8.3 and 8.4 below). The VMDS was bolted to the fire appliance's dashboard and this meant that only the officer in charge could access risk, map and tactical information whilst the fire appliance was on the move. Inside fire appliances this centralised activity to the officer and compressed access to information to interaction between the sub-officer and the VMDS even while universal access had simultaneously extended the spatial reach of information retrieval beyond stations' usual turn-out boundaries.

⁷⁰ The situated and collective basis of organisational knowledge or knowing has been made in relation to information technology by others, particularly research inspired by ethnomethodology. Harper and Hughes (1993), for example, conducted an ethnographic study of air traffic controllers and Heath and Luff (2000) studied the coordination of London underground trains. Both studies emphasise the irreducibly collective and situated character of coordinating what is going on in what might be considered individualised work tasks of routing airplanes and timetabling underground trains.

The second effect related to temporal pressures on the officer in charge whilst on the move and the collective ability of fire crews to check with each other 'how things are going' as they approached an incident (see Harper and Hughes, 1993: 142). This meant specifically that the temporal pressures on the sub-officer intensified because of the compression of interaction within fire appliances around the VMDS. Officers regularly described the not insignificant difficulty of putting on fire clothing, boots, accessing the VMDS, helping to the driver to navigate, watching out for other vehicles, deciding upon an initial 'incident plan' and attending to radio communication to the command and control centre. The addition of 'pressing buttons' on the screen to initiate prints of VMDS records, map directions and hydrant locations was not a simple matter for officers under these temporal pressures. As a result of the spatial and temporal configuration associated with the VMDS and the new mobile division of labour, fire crews described how the VMDS led to communication problems between crews.⁷¹ For many fire crews the spatial and temporal effects described above meant that VMDS would not be accessed until the fire appliance reached the incident and was stationary.⁷²

⁷¹ Fire crews described their mixed reactions to increasing levels of movement between stations. Firefighters nearly always described the close bonds within particular fire crews and how this has an affect upon how incidents are approached. An officer at Bromsgrove remarked 'a crew of five people work together really hard all the time know each others' weaknesses and strengths and therefore work together better than a group of five individuals all of whom are equally trained but don't work together as a team, aren't as efficient as that team'. The same officer continued by setting out the advantages of the global crewing system in terms of the benefits of mixing crews across Hereford and Worcester Fire Brigade, so that 'all Blue watch eventually see each other and get to know each other on a more regular basis'.

⁷² Collaboration between stations is delimited to large incidents. The Sun Valley fire was, for instance, a thirty pump/appliance incident and in terms of the number of appliances mobilised this was a very unusual incident. Incidents involving ten or more appliances were rare as an officer who had been at Hereford and Worcester Fire Brigade for over a decade remarked: 'I'm trying to remember the biggest fire I've been to, I've not been to a ten pump fire so that shows you'. Current usage of the VMDS by fire crews was also minimal. In addition to the spatial and temporal effects associated with the VMDS firefighters described how information held on the VMDS was i) often factually incorrect, and, ii) used for non-incident management purposes as much as at incidents. One firefighter described 'the CRR [the central risk register on the VMDS] we looked at the other day didn't have a map reference [for the incident location] and the keyboard wasn't working well'. The officers' handbook was used more often, the firefighter continued, 'say, 10 per cent of the time', but more often it was used when the crew had returned to the station and were completing the Home Office FDR1 fire report form. On the use of CHEMDATA, one of the most positively associated uses of the VMDS, a firefighter at Redditch commented that 'often chemicals aren't on CHEMDATA, nor do [command and] control know ... there are only 35,000 chemicals on CHEMDATA but there are millions of chemicals'.

8.3 Fire Crew Enrolment, Ambivalence and Durability of the VMDS

This section develops points made above in relation to the situated character of fire crew coordination when mobilised to an incident. The concern here is, however, to examine fire crews' use of the VMDS in actor-network terms and this means shifting from an emphasis upon the situated and collective character of crew coordination described in the above section to the actor-network that maintains the possibility of situated practices as necessary but largely unaccounted for outside of fire crews' everyday work, and which had, at the time the research was conducted, little impact on the future development of the VMDS.

Chapters 6 and 7 argued that the problematisation, purifications and translations associated with the VMDS are not reducible to coordinated ploys by cynical senior officer or to firefighters being duped from their 'real interests' (Lukes, 1974). Nonetheless the previous section set out a number of spatial and temporal consequences relating to the implementation of the VMDS that an external observer of the brigade might expect fire crews to complain about, resist or make representations to their brigade union officers.⁷³

This section considers the fire crews' actor-network and how this is related to the ongoing enrolment of firefighters and their enrolment of other actors in the situated and collective upkeep of the VMDS.

Fire crews did moan about the VMDS but it became apparent during the research that crews were both 'ardent stalwarts and outspoken critics' (Michael, 1996) of the VMDS—they were good publicists and sceptical of the current usefulness of the VMDS. Put another way fire crews encounter the VMDS in (at least) two ways, often simultaneously. Firstly, fire

⁷³ The strength of trade union representation and density, and the union's focus on maintaining firefighters' working/employment conditions, worked against analysing the VMDS as a 'Trojan horse' (Grint and Woolgar, 1997). Sorge and Streeck (1988: 20), for example, argue that trade unions in Britain have largely conceived of technologies within pluralist-functionalist assumptions, with technological innovations understood as exogenous to semi-autonomous social sub-systems. In general terms this means that trade unions 'have often been quite content to limit themselves to negotiating with industrial relations managers on wages and conditions, and dealing with technology only in so far as it affects the latter'.

crews enrol other human and non-human actors in order to maintain the durability of the VMDS. In this way fire crews construct their own VMDS actor-network around, as set out below, maintaining existing working conditions and long-term hopes for the management of incidents through advanced front-line ICTs. Secondly, crews problematise the stable actor-network of a technologically mediated future for the provision of fire services. This dual emphasis was difficult to make sense of at first until it became apparent that examining the simultaneous ‘buying into’ and criticism of the VMDS meant tracing how the ‘ambivalences and the dual status of insider and outsider at once sustains and subverts the network’ (Singleton and Michael, 1993: 234).

This emphasis upon ambivalence in relation to the VMDS connects to the argument set out in Chapter 3. For fire crews the VMDS is simultaneously a black-boxed computerised system with some taken for granted benefits, and a disordering and unstable artefact, which fire crews attempt to maintain as durable in a number of ways. Put another way the practical constraints on fire crews associated with the VMDS (i.e., problems of coordination in the fire appliance cabin) heightened the ontological question—what is the VMDS—as well as requiring crews to back-up the VMDS in various ways.⁷⁴ Singleton and Michael (1993) suggest that analysing the relationship between stabilised/black-boxed/arborescent schemas and unstable/seamless webs/rhizomes means understanding actor-networks as made up of other actor-networks each comprising of varying degrees of stability and instability—arborescence together with rhizomes and rhizomes together with arborescence. This allows for the recovery of ambivalences and multiplicities from the ‘clean and clear’ networks that are considered characteristic of early accounts of actor-network theory (for instance, Callon, 1986; Latour, 1987). These ‘classic’ studies are associated with positing the durability of networks in terms of the disciplined, rule-

⁷⁴ The ambivalence of fire crews to the VMDS does not mark out competing interpretative schemas (and the corollary that socially constructed definitions can be tightened up). Rather, instead, it refers to the contested ontological character—what is meant by—the VMDS.

following actors. In contrast an emphasis upon ambivalence suggests that ‘a network is rendered durable by the way that actors at once occupy the margins and core, are the most outspoken critics and the most ardent stalwarts, are simultaneously insiders and outsiders’ (Singleton and Michael, 1993: 232).

The task of transferring paper 1.(1).D records to the VMDS, and ongoing management of information, was, as described in previous chapters, undertaken by the Operational Intelligence Unit. Stations sent their paper 1.(1).D records to the Operational Intelligence Unit for transferring onto the VMDS. It was quickly noticed by fire crews, however, that a significant proportion of previously station-based 1.(1).D records had not been transferred onto the VMDS even though these records had been sent to the Operational Intelligence Unit. ‘Nor would these paper files be put onto the VMDS in the future’, said a sub-officer at the Operational Intelligence Unit, and ‘they’re now in the process of being thrown away’.

This rationalisation of the number of risk records meant that although fire crews had universal access to risk records for the entirety of Hereford and Worcester Fire Brigade’s area of responsibility, and the overall number of risk records fire crews could access increased, the number of risk records for a particular station’s turn-out boundary was often reduced. The problems of arbitrary, unsystematic and often out of date station-based records were reconfigured into absent records.⁷⁵ At the time the research was conducted 189 risk records were available on the VMDS (Operational Intelligence Unit, CRR File Index, Issue 7, July 1997). The initial rationale for implementing the VMDS was to rectify

⁷⁵ Firefighters described how paper 1.(1).D records often contained out-of-date information although even this information could be useful at incidents. One of the sub-officers from the Operational Intelligence Unit described the how the station-based practice worked and the problems associated with it: ‘Well, it all depended on how the station commander/officer ran his station so one station might give you the chance to be an officer in charge and another might just say here’s a programme off you go and you did what you felt like. What seems to be happening is that they [fire crews] were just doing re-inspections so there was nothing new ever going on, they just went around what was existing so whatever the set buildings were that had the information they just went and checked those buildings again, they didn’t seek new buildings to increase the list’. With the introduction of the VMDS, the Operational Intelligence Unit decide which risks are to be inspected.

the information and communication failures at a major incident in 1993, and fire crews remembered this incident and the broad appeal associated with the VMDS. This initial rationale and broad appeal helped sustain the VMDS as a 'black-box' (see Star, 1992). Yet the black-boxed VMDS was simultaneously associated with a reduced level of access to relevant local information and with considerable difficulties in accessing information on the move (see Section 8.2 above). The small number of records was not, however, related to the technical constraint—that is a lack of computer memory on the VMDS—as discussed by the assistant divisional officer responsible for the development of the VMDS. An appraisal of the technical capacity of the VMDS

confirmed that there is sufficient space on each 1.3GB hard disk to store TIP [tactical information plans/risk records] and secondary information in excess of 4,000 premises, keep copies of all operational procedures and the officers' handbook. Store full chemical hazard information on in excess of 115,000 chemical references ... and still have sufficient free space to maintain copies of maps for the whole county including overlays of informative details ... such as water sources, hydrants and significant features. (Goodwin, 1997: 40).⁷⁶

Although stations were told to throw out their paper 1.(1).D records and paper OS maps a number of stations were, at the time the research was conducted, reluctant to do this and had kept spare copies of 1.(1).D records and maps (often the spare copies were the back-up copies kept in a 'standby box' in the station). Fire crews held in reserve the A4 folders that contained 1.(1).D records folders and OS maps in the fire appliances; sometimes these records and maps were openly kept by fire crews whereas others had them hidden under the seats of fire appliance as 'back-ups' (see Faia-Correia et al., 1999) to the 'incomplete' VMDS. Not only had an attempt to remove paper records not occurred but firefighters also

⁷⁶ The 189 records available comprises of less than 5 per cent of the technical capacity of the VMDS of around 4,000 premises. Fire crews described how it was usually smaller risks sites that had not been transferred onto the VMDS. The VMDS comprised instead of larger risks such as industrial buildings, hospitals and schools that would be out of fire crews' turn-out boundaries. Firefighters often contested this approach to information management which emphasised large-scale risk as firefighters describing how they all knew about 'big risks' because they were the ones which are visited/inspected on a regular basis. It was, I was often told, the smaller risks which firefighters often said were the ones they needed to know more about. Firefighters also described how even if a fire crew attend an incident outside its turn-out boundary the nearest fire crew to the incident will have arrived and have begun to manage the incident.

consult concealed paper records and accessed the VMDS screens. Fire crews, in other words, attempt to maintain the situated and collective practices that were characteristic of pre-VMDS fire appliance collaboration.

It has been suggested above that fire crews remained committed to the VMDS even while they continued to use 'out-of-date' paper records and maps. This use of records and maps which stations had been told to throw away could be understood as workplace resistance, threatening the functionality of the VMDS or undermining the work of Operational Intelligence Unit. This conclusion would, however, be a simplification of the ways in which fire crews simultaneously affirm the role of VMDS whilst also problematising its current usefulness. Suchman and Wynn (1984), for example, argue that rules and procedures are not applied in a deterministic manner; rather procedures are followed or violated depending upon an understanding of what constitutes acting in accordance with a procedure or rule in a given situation (see also Francis and Hester, 2004).⁷⁷ Similarly fire crews support the VMDS with other resources—A4 folders containing 1.(1).D records and paper OS maps. This alignment of fire crews with the VMDS requires, as suggested above, 'internal network building' on the part of the crews (see Michael and Singleton, 1993), and this means that instabilities associated with VMDS information are reworked by fire crews' use of non-VMDS artefacts.

Fire crews are simultaneously enrolled in the VMDS and are enrollers of other actors: fire crews buy into the capacities of the VMDS and 'strategically problematise' (Michael and Singleton, 1993) the VMDS.⁷⁸ This means that instabilities associated with the VMDS constitute a resource—'the indeterminacy necessary'—for fire crews to construct their

⁷⁷ Rules and procedures have, therefore, an organisational purpose beyond the strict application of the rule or procedure. At Hereford and Worcester Fire Brigade following the rules and throwing away paper records would detract from fire crews' effectiveness (see also Zimmerman, 1971). Weick's (1993) study of smokejumpers in Montana, USA, examines how groups respond to incongruous events.

⁷⁸ This strategic problematisation can be understood as a selective cutting of the network around its current lack of appropriate risk information.

identity in relation to the actor-network of the VMDS (see Michael and Singleton, 1993: 241; Singleton, 1998). In terms of indeterminacy and the consequent enrolment of other actors by fire crews, two issues are important in the short-term. First, whilst paper back-ups threaten the functionality of the VMDS, fire crews simultaneously demonstrate the ongoing importance of their work as skilled users of technical equipment. This also demonstrates the role of crews in the successful operationalisation of front-line ICTs even though information management has been centralised to the Operational Intelligence Unit.⁷⁹ It is through the enrolment of an array of materials in support of the VMDS—as a potentially successful front-line information and communication technology—that fire crews attempt to construct themselves as a ‘centre of discretion’ (see Munro, 1999) with regard to future provision of fire services. Second, within the hierarchical structure of fire brigades, using the paper-based records is what the fire crews can do to maintain the workability of the VMDS.

Beyond the short-term, fire crews enrol other actors to make the VMDS workable because it is congruent with fire crews’ long-range understanding of their work in a number of inter-related ways. First, the VMDS is aligned with the promise of a broad technological solution to the vagaries of government and managerial inspired initiatives, with current limitations deferred to future development of the VMDS (see also Section 8.4 below). The paper risk records which fire crews used to back-up the VMDS were, for example, part of a longer term rationalisation of records set in motion by Home Office recommendations which the VMDS could, with its potential to hold over 4,000 risk records, reverse in the longer term.⁸⁰

⁷⁹ Michael and Singleton (1993: 247) suggest that is the dual association of GPs as a conduit of medical science and as working in patients’ interests that constitutes their ambivalence.

⁸⁰ Fire crews often described the future potential of the VMDS as helping them in their work. Michael and Singleton (1993) argue that the prospect of perfectability, in this instance of risk and mapping information, is a means to ‘re-entrench’ actors because the instabilities of current practices are ‘managed in terms of an ideal’ in the future—a future based around new ways of understanding risk, for instance. This narrative of technological progress is dependent upon problematic symptoms in the present and with current technology (see also Chapter 6). It was argued above that the identity of fire crews is in part constituted through the

One of the sub-officers at the Operational Intelligence Unit describes the management of information prior to the VMDS and provides a longer time frame into the hopes associated with a technologically mediated future—hopes that are reinforced by previous rationalisation of the number of risk records held by stations:

Sub-Officer: Yeah, one of the things that happened about nine years ago [late 1980s] they actually took a load—they actually had things called risk cards with information—they were taken away and replaced with this 084, because that was what the Home Office guidelines says.

Researcher: It was more detailed, wasn't it?

Sub-Officer: It was more detailed but effectively no different. The risk cards were pretty good but this guidance that came from the Home Office why they changed it all and obviously the guidance was set out without the intention of devaluing information which is obviously something I don't know much about to be honest written into it to make them [fire crews] take off the old ones then replace them with the new ones because stations were told to have a certain number not a—they would do as they were told—we only want eight or ten, we don't want 30 or 40. Now why take off information that's of use but maybe that was for storage reasons I don't know.... So that changed that and there was a slight problem there and the information did appear to have been downgraded slightly although it was meant to be better.

This passage from an interview describes the shift from one paper system (see Plates 1 and 2, Appendix 4) to another paper system (see Plates 3-5, Appendix 4), is relevant to the introduction of VMDS records in a number of respects. It demonstrates that the changes in the use of records at the brigade are more than a one-off event. VMDS records, introduced in the late 1990s, came out of paper 084 risk records, and the 084 risk records, introduced in the late 1980s, were themselves based upon risk cards, each of which were instantiations of previous practices going back to the mid-1970s. In this sense the introduction of the VMDS does not suddenly constitute an entirely new turn to 'information management' at the brigade although there are important differences between paper and VMDS records. The reduction in the number of risk records has a precedent a number of years before the VMDS. Contextualised against previous rationalisations, the VMDS is associated with an increase in the totality and type of information available to fire crews within the brigade.

instabilities associated with the VMDS but that these instabilities can be resolved with future developments of the management of the VMDS.

Given this, the VMDS is both continuous and discontinuous from previous practices, accepted because it is aligned with particular continuities (that is, transfer of paper records to screen-based information, connected with previous rationalisations) and discontinuities (that is, overcoming the constraint of limited storage space with paper records, previous rationalisations). Second, the small number of records is attributed to the lack of technical expertise in the Operational Intelligence Unit which is itself related to managerial/funding (rather than technical) problems; recruiting an CAD/CAM expert in the labour market is difficult because of the low rates of remuneration offered by the brigade.⁸¹ Third, although the VMDS is associated with changes to managing risk, the device is, critically, not associated with challenging existing national-level employment conditions or the regionalisation of information management practices (cf., the proposed regionalisation of command and control rooms). The VMDS is, in other words, trusted because it is associated with front-line information provision, commensurate with existing employment conditions and distinct from other managerial initiatives concerned with changing working practices.⁸² Integral to this, the VMDS is, as argued in Chapters 6 and 7, associated with a broad reaffirmation of the importance of brigade-level authority and fire crew competency (see also Chapter 6). Fourth, the VMDS is one way of catching up with government under-investment in IT compared with other parts of the public sector and making Hereford and Worcester Fire Brigade special vis-à-vis other UK fire brigades. Fifth, the VMDS is aligned with a firefighter-centred formulation of risk (discussed in detail in Section 8.4) which challenges national reviews such as the Audit Commission's report (1995) (see Chapter 4, Sections 4.8, 4.8 for more detail; see also Chapter 7, Section 7.5 and next section for a

⁸¹ One of the sub-officers at Kidderminster summed up the poor management in the following terms. He described how management practices and structure are 'way behind other brigades, but the appliances are state of the art'. The associations of the VMDS are consistent with a view of the brigade as one that has invested in the latest fire equipment but has out of date managerial practices.

⁸² Firefighters often described the VMDS as outside of senior officer initiatives. The assistant divisional officer responsible for the VMDS always mentioned firefighters' acceptance of the VMDS as he found it difficult to understand why the VMDS had not caused more controversy.

discussion of risk). The Audit Commission's report recommended, for example, local working practices and local risk categorisation (see Chapter 4, Section 4.8). National reviews and the implementation of the VMDS are, then, associated with fire service provision specific to local circumstances, however the VMDS is associated with particular forms of local practice—a new approach to risk that is focused upon firefighter safety and the devolvement of decision-making at incidents through use of advanced ICTs within current national standards and practices. Changes to workplace practices and risk calculations, such as differential crew levels over a 24-hour period, mobile fire appliances and risk defined as changing throughout the day (Audit Commission, 1995: 31; see also Bain, et al., 2002), were not connected to the VMDS.

The general implication of fire crews backing up the VMDS in order to maintain its durability is, then, that actor-networks maintain their durability not only because of 'clean and clear' alignments, black-boxing of devices and unproblematised visions of the future. In other words, using non-VMDS resources, which contravenes the procedures laid down by the Operational Intelligence Unit, can be understood as both attempts to maintain the workability of the VMDS and to make up for present-day limitations: whilst fire crews' use of paper records/maps deterritorialises the VMDS it does not unravel the VMDS actor-world (although this could take place at a later time). Following Michael and Singleton (1993: 257), 'ambivalence, ambiguity, problematisation, marginality and multiple identities can also play a part in the reproduction of a network'. From this it can be argued that what the VMDS is and becomes comes out of a mediated history of the social, political, professional and organisational interests.

8.4 The Politics of Funding, Risks to Fire Crews and the VMDS

Following the points made above, this section develops the argument that the VMDS is an innovation to ‘make sense with’—positing a context for action as well as a content for action. The VMDS is, in other words, a resource for constituting, charting and elaborating the problematic of fire service provision. Making sense with the VMDS is examined in this section in relation to tensions centring on the establishment of a Hereford and Worcester Combined Fire Authority and the inconsistencies of existing risk classifications (see Lloyd and Roen, 2002). Rappert (2001) provides an approach to examining the capacities of technological innovations that draws upon the notion that technologies are made sense with in particular ways. For Rappert, how ambiguities are handled—the how, the location, to whom ambiguities are articulated through—reveals much about the relational capacities of technologies, the distribution of responsibility and accountability.⁸³

The Hereford and Worcester Combined Fire Authority was formally established on 1 April 1998.⁸⁴ The role of Hereford and Worcester Fire Brigade is still to provide fire cover for both counties, but with funding proportionate to the population density in each county—Herefordshire contributing approximately 33 per cent and Worcester 66 per cent of the funding for fire service provision. Operational practices were however to remain unchanged from the previous Hereford and Worcester Fire Brigade.

During the period of research it was suggested that there was a sense amongst the population living in Herefordshire that they were contributing a disproportionate amount towards the provision of fire services under the new combined authority structure. This

⁸³ This means that ambiguities are a topic of analysis not problems to be resolved. This means, for Rappert (2001: 585), that ‘examining the capacities of technology is not a matter of specifying their actual effects or merely noting the space for indeterminacy, but instead building an approach sensitive to the conditions under which interpretations are made’.

⁸⁴ The previous reorganisation of counties in 1974 meant that some towns that had been part of Worcester County Fire Brigade (for example, Halesowen) became the responsibility of the West Midlands Fire Service (see Chapter 6 for a discussion of inter-brigade relations).

was, however, contested within Hereford and Worcester Fire Brigade. For instance, according to a divisional officer at brigade headquarters the proportion of incidents do not follow the one-third to two-thirds population/funding division. Instead significantly more than two-thirds of incidents are within the boundaries of the county of Worcester, as the officer explained:

Div. officer: Most of the stuff is in the north eastern corner [in] which you get Redditch, Bromsgrove and Kidderminster, is your greatest bug of concentration.

Researcher: So it is more than 66 per cent of the activity?

Div. officer: Oh yeah, without a shadow of doubt. But you try and tell people that are in rural communities like Herefordshire when you've got a place that we can't even get to the standard fire cover.

In conjunction with the introduction of the Hereford and Worcester Combined Fire Authority in 1998, a number of changes were made to the permanent location fire appliances. The most controversial of the changes to the level of fire cover amongst fire crews and officers was at the station in Redditch in the county of Worcester, which was downgraded from a B to C risk station, and the station at Hereford, the county town of Herefordshire, which was upgraded from a C to a B risk (see Appendix 2, Table 4 and 5).

In order to determine the level of fire cover at stations across the newly established Combined Fire Authority, Hereford and Worcester Fire Brigade undertook a risk cover review prior to April 1998 which assessed the level of fire cover based upon population density and type of risk. The changes to Redditch were made, as a sub-officer remarked, despite there being 'still big chunks of B' in Redditch. There were a number of implications of reducing the level of wholetime resources at Redditch. This included, said a firefighter at Bromsgrove station, 'instead of having two appliances in together or within minutes of each other, you get one plus this other one, [turning out, and] that has significant health and safety implications to the crews' (see also Chapter 7, Section 7.4). The sub-officer continued that the criteria for the risk cover review were the type of industry, type of building and population density but not the historical pattern of fire calls related to a

particular station. By contrast, in previous reviews, Redditch has been categorised as a B risk even though it 'ought to be a C':

Sub-officer: ... the previous Chief Fire Officer did say well Redditch is a C risk really because its spread our factory units they don't all match up in these level squares so it ought to be a C risk but I as Chief Fire Officer—this is the previous Chief Fire Officer—know the massive spread in population in Redditch so I will say as Chief Fire Officer that I want Redditch as two appliances and a hydraulic platform—this Chief Fire Officer took a different view.

Researcher: The figure came out [in the review before April 1998] to be C and therefore it was a C category?

Sub-officer: Right, what you have is retained firefighters at Redditch going to a monstrously large number of fire calls they never ever went to before now I believe this must be costing the Fire Authority a fortune ... they pay turn out and attendance, turnout plus hourly rate.

Previous agreements to allocate resources to Redditch beyond its 'official' risk category were not, however, associated with political decision making. Rather maintaining Redditch as a B risk station was an example of internal objectivity—resources allocated by risk cover assessments in conjunction with, in this instance, the particular urban design and demographics of a new town with a high rate of incidents.

The upgrading of Hereford station was, by contrast, associated not with disciplinary, mechanical or internal objectivity but the distorting effects of the politics of brigade funding and the 'price that had to be paid' by other stations in the county of Worcester to keep Herefordshire county council aligned with the Hereford and Worcester Fire Brigade as a single brigade:

Researcher: What was the purpose of the actual exercise, of doing the fire cover review?

Sub-officer: Well, I think there was probably a lot of politics in it, as much as I don't blame the Chief Fire Officer necessarily, I could see a political backdrop, a political gain to which I believe had a bit of a spin off from the amalgamation—sorry the change of counties.

Researcher: Right, the Combined Authority.

Sub-officer: Yes. I mean Hereford, for instance, was upgraded significantly as a fire station and Redditch was downgraded significantly. Now little things don't ring true. For instance both appliances at Hereford in the year prior to the fire cover review did not go to as many incidents as one appliance on its own at Redditch.

The 'political backdrop' mentioned above was also associated with the deployment of resources to retained stations. Later in the interview the sub-officer described, as did others during the period the research was conducted, the categorisation of risks as political because the results of the risk cover review were changed after the review, particularly for smaller stations in Herefordshire. Changes to the review's results were again associated with the soon to be established Combined Fire Authority, in particular the sensitivity over the percentage of funding from Hereford and Worcester councils, and the level of public outcry over attempts to close stations, particularly rural stations in Herefordshire (see also Chapter 4, Section 4.9):

There were proposed closures of five stations [including two retained stations] but the council under the weight of public opinion in those [retained] areas decided not to close fire stations, so the fire cover review was changed anyway (sub-officer).

For this sub-officer, maintaining retained stations is associated with overturning the results of the risk cover review through the distorting effect of public opinion—political decision making rather objective risk assessment. The important point is not whether Redditch station or retained stations can be objectively shown to require more or less resources or warrant closure. Rather, examining the contention that there is a division between what is objective and non-political and what is biased and political is of analytical interest: the previous practice of allocating resources on the basis of the number of fire incidents at Redditch is not, for instance, associated with political decision-making even though this overrides standardised forms of risk assessment whereas allocating resources against a backdrop of the controversy of the financial contributions is attributed to brigade politics.

The politicised risk cover assessment prior to the formation of Hereford and Worcester Combined Fire Authority was not associated with direct consequences for the VMDS. This helped to maintain the division between VMDS as outside brigade politics and other initiatives such as the risk cover assessment as infused by politics (see also Bloomfield and

Vurdubakis, 1994). The VMDS also provided an occasion to perform the brigade as a single and coherent entity after the introduction of a different funding regime, and changed the organisational and geographical redeployment of firefighting resources: within Hereford and Worcester Fire Brigade the VMDS is implicated in the redistribution of tensions surrounding establishment of the new brigade status and organisational structure. This redistribution occurs by firefighters drawing upon the universality of the VMDS to make sense of the new status and structure as one of continuity with the previous brigade structure. Contextualised in this way, in conjunction with hopes for future functionality, the tensions surrounding Hereford and Worcester Fire Brigade in relation its neighbouring brigades—how much funding comes from each county, what is the geographical boundary of the brigade—can be set aside, at least contingently, through an association of unity via universal access to information across the county boundaries of Hereford and Worcester (see also Chapter 6).

The sense of a unified brigade is, however, not only instantiated through the universal access to information. A further way in which the VMDS is contextualised as a single brigade is through the alignment of the VMDS with global crewing. With this form of mobility, in part afforded by the VMDS (see Chapter 7), firefighter movement was often across county boundaries and this reaffirmed the unity of the brigade even while it disrupted individual fire crews at stations. This is somewhat paradoxically illustrated by the effects of the additional resources deployed to Hereford station as part of the risk cover review. Subsequent to the risk cover review, which as described above fire crews considered to be distorted by brigade politics, the extra firefighting resources allocated to Hereford became some of the first resources to be used for the purposes of global crewing. Hence, although Hereford had gained extra firefighters as part of the risk cover review, the

station often lost a number of these firefighters to other stations—including to Redditch station—as an effect of global crewing!

The neutral tool view of the VMDS is also sustained in part because of the institutionalised practices associated with the Operational Intelligence Unit—mechanically objective practices which standardise previously arbitrary and unsystematic station records. Because the VMDS is associated with neutral, universal access and the formalisation of information management, the VMDS was enrolled in redistributing opposition to the risk cover review in two inter-related ways. Firstly, firefighters articulate how previous and existing risk classifications were compromises rather than absolutes. Secondly, a new approach to risk that is centred upon VMDS mediated firefighter safety at incidents that, within national risk categories, adds a further dimension to what counts as risk. Firefighters across the brigade described risk cover classifications (A, B, etc.) and the location of firefighting resources as partial resolutions—the outcome of previous trials of strength in Latour's (1999) terms—to changing urban planning assumptions over time, building materials and construction practices, and legacies of equipment located at particular stations. These compromises were often expressed in terms of 'the impossibility of keeping up' with changes to urban and industrial policy/development (such as the use and internal design of factory units, location of chemicals, etc.). There were, in addition, inconsistencies in risk classifications within station turn-out boundaries. An example of this was described at a meeting convened to discuss the development of the VMDS. A leading firefighter expressed what he considered to be a significant problem with risk cover assessments within stations' turn-out boundaries. He described the Baxendale chemical factory that was assessed as warranting B risk fire provision but which was located in an overall C risk area. The B risk building is an overall C risk because there are not enough buildings in the B risk category in the surrounding vicinity. The result of this is a disparity in the initial deployment of firefighting

resources to an incident at the factory: an incident at the factory would initially be sent one fire appliance because it is a C risk whereas the same factory in a B risk area would initially be allocated two fire appliances. The firefighter's point was that that existing risk classifications fail to capture local circumstances.

The disparity between standardised analysis of risk and local circumstances was also illustrated by developments in the 1990s to centralise fire incident analysis to the Home Office. A non-operational sub-officer described how analysis of fire incidents, which the brigade used to compile but which was now considered unwarranted as it was done by the Home Office, also fails to take account of local contexts of fire service provision. The sub-officer described how he had become interested again in spotting local trends because his car had been stolen the previous year and it had been set on fire. He described how he had noticed a 'higher number of cars than normal' being stolen and found burnt, out from his study of the records he had also noticed that 'there have been a higher number of chip pan fires in Redditch more than anywhere else in the county [brigade]—that's simply by going through the fire reports'. From this the sub-officer outlined what he considered to be the problems of submitting fire reports to the Home Office for centralised fire service-wide analysis. First, the nation-wide report on fire trends and fire services' performance takes two years to produce, and, second, this has been associated with a centralisation of initiatives to promote fire safety and hence a lack of sensitivity to particular brigades:

Sub-officer: Now, that information [on local trends in incidents/'hotspots'] is extremely difficult and time consuming to obtain. The Chief Officer could say there will be a fire safety campaign. There's a Fire Safety Week every year, it's usually October, now the campaign is given to us by the Home Office. Now what would be better for [Hereford and Worcester Fire Brigade] to say, 'well, okay', that may be okay for Manchester or Liverpool but in this area we need to target a certain area, a particular field of people, or a particular problem.... You are allowed a certain amount of licence whereby local stations can have open days and do demonstrations of chip pan fires and things like that but the overall campaign is governed by the Home Office Fire Safety Inspectorate.

Later in the interview the sub-officer described a pattern of incidents at Redditch:

Officer: I can tell you that Redditch is one of the worst towns in this part of the country for fire fatalities in domestic property. It's a fact.

Researcher: What's the reason for that?

Officer: Well, okay, it's a large conurbation of people who've been rehoused. With particular—without trying to sound snobbish—but particular social classes who probably think fire safety is not the most important thing. We've had a number of malicious fires in Redditch where properties have been deliberately ignited.

Researcher: Because they have a lot of fire calls in Redditch, don't they?

Officer: Yeah, it's a very busy town.

Researcher: 1,700 calls or so a year, I've heard.

Officer: Yeah, it's a very, very busy town.

Researcher: And they've only got one full-time pump as well, right?

Officer: Yeah, they have.

Researcher: They must be on their feet most of the time?

Officer: They are busy and the retained, part-time firemen are busy. Now I can tell you that because I go through these [fire reports, FRD1] every month and I think—you got Redditch again, Redditch again, and the ones that hit the television, domestic property fires, always tend to be Redditch. Those two kids that were killed there last year—someone poured petrol through the letterbox; you see, there were five people killed in that incident in Redditch.

Researcher: Someone died yesterday, didn't they?

Officer: Yeah, that looks like that was arson, but they're not sure yet.

The classification of the Baxendale factory and the Home Office analysis of fire incidents illustrate firefighters' concerns about national risk classifications and practices for analysing incidents because they do not take account of local, brigade circumstances. The emergence of new approaches to managing risk and safety at incidents over time was described by a sub-officer at the Operational Intelligence Unit in terms of a shift from *a priori* risk classifications to analysing situated risks to firefighters at incidents (see Bain et al., 2002). As part of this shift 1.(1).D records were renamed 'Tactical Information Plans' (see Plates 1-3, Appendix 5).

Prior to the 1990s, the sub-officer at Operational Intelligence explained that 'health and safety went out of the window as soon as we went out to the fire doors [the doors of the fire station], well in fact it was no longer an issue although we would wear things like the high visibility jacket'. According to the sub-officer whilst the fire service 'did some things [for

safety] ... but whether we necessarily were taking it seriously enough was another matter'. The previous function of 1.(1).D risks records (i.e., the paper based risk records; see Plates 1-5, Appendix 4), was to provide information 'which would improve how quickly you'd attack the fire, save lives, and firefighters' lives although that [firefighter safety] was indirect, not a direct reason for processing that information' (sub-officer, Operational Intelligence Unit). The sub-officer continued to describe how VMDS Tactical Information Plans were, by contrast, directly associated with firefighters' health and safety at incidents. In addition, Tactical Information Plans were not associated with changes to the level of fire cover or the number of firefighters allocated to fire crews (cf., Audit Commission, 1995; Larking, 1997: 22-23).

In place of the what fire crews considered the sometimes arbitrary and unsystematic practice of maintaining and updating station 1.(1).D records and the ambiguity of firefighters' responsibilities vis-à-vis entering a burning building, the VMDS was aligned with the materialisation of managed, formalised and standardised procedures that protect fire crews by changing firefighters' relationship to burning buildings. For instance, whilst undertaking the research at Hereford and Worcester Fire Brigade firefighters would often discuss firefighting in the future as one in which fire crews would not enter a burning building, particularly if the building was empty—something which constitutes a significant break from previous assumptions:

Sub-officer: Well, certainly buildings such as supermarkets aren't built out of materials which would save them if there were a fire. They are built to be lost. They decided it's cheaper to lose the building and rebuild it.... They are prepared to lose it rather than spend money putting sprinkler systems in every building which would cost them more they reckon.

Researcher: Why risk firefighters lives?

Sub-officer: Exactly, why should we, we're not going to put people's lives at risk to save their building.

Researcher: Jim did qualify if there are people in there.

Sub-officer: Well, we'd have to go in, yeah. You wouldn't risk people's lives. That's probably the only time there's a stiff balance—you can't send them in

without assessing how bad it is, but you would certainly make more of an effort because at the end of the day the very nature of the job is hazardous, you know.

In this passage the sub-officer describes how fire crews increasingly make a detailed assessment of the level of risk at an incident using the Tactical Information Plans on the VMDS before committing firefighters to a burning building—whether this is an A, B or C risk area and whether the fire crews are wholetime or retained. Instead of a ‘get in there’ approach, decisions are deferred to technocratic practices: the archive of VMDS Tactical Information Plans records is, then, implicated not only with accurately recording the past, but with a future centred upon the information-based management of incidents and devolved incident decision-making using the VMDS. In this way, the VMDS and the Operational Intelligence Unit provides a resource not only for collective aspiration for more precise and technocratic decisions for the deployment of fire crews within the existing risk classification, but for the articulation of a commitment to firefighter safety by officers using VMDS Tactical Information Plans which would, in certain circumstances, prevent firefighters entering a burning building.

Definitions of risk based around firefighter safety are connected to fire crews’ approval of centralising practice of the Operational Intelligence Unit—practices that objectify crews’ work (see Hereford and Worcester Fire Brigade, Operational Intelligence Unit, 1997a, b). Cussins (1998), for example, suggests that procedures that objectify are not necessarily antithetical to identity but are subject to what she terms ‘ontological choreography’. Practices of objectification are aligned with opportunities or constraints depending upon how objectification relates to long-range commitments and aspirations: fire crews draw upon the implementation of the VMDS and the establishment of the Operational Intelligence Unit as a resource for a vision of technologically advanced fire service provision.

The emergence of this tentative configuration of risk—risk aligned to firefighters rather than buildings— simultaneously devolves responsibility to the first officers at incidents and to the reliability of the Operational Intelligence Unit’s information management practices. In this way the inconsistencies of funding and risk cover classifications, and ambiguities relating to firefighters’ responsibilities at incidents are mutually implicated in the future capacity of the VMDS (see Chapter 9). In the short-term, then, global crewing helps ameliorate the effects of a politicised risk cover review. In the longer term the VMDS is associated with replacing existing risk classifications with Tactical Information Plans held on the VMDS, whilst maintaining national standards and current working practices.

8.5 Concluding Remarks

This chapter has argued that the VMDS is far from a stand-alone device and is associated with a range of spatial and temporal effects on fire crew coordination. It has also been suggested that the development of the VMDS is premised upon the assumption that information can be dislocated from the situated and collective context in which fire crews’ work. In consequence fire crews are critical of the current usefulness of the VMDS but in order for the VMDS to be workable crews must continue to support the VMDS in various ways including backing-up VMDS records with paper-based records, maps and radio communication to the command and control centre.

Fire crews engage in constructing a local actor-network for the VMDS because, with the increasing spectre of political and managerial intervention, the VMDS is aligned with their short-term interests and long-range aspirations of maintaining the provision of fire services around firefighter concerns. For many firefighters their interests are served by placing front-line incident management on a more technologically advanced footing. By defining the VMDS as a successful innovation, but successful by deferring its benefits to the longer

term, fire crews' enrolment of other actors to maintain the workability of the VMDS can be understood as an attempt by firefighters to maintain some discretion over the future direction of fire service provision. An example of this is the alignment of the VMDS with new ways of approaching risks to firefighters through the use of VMDS Tactical Information Plans: the VMDS is associated with playing an important role in decisions relating to firefighter safety and appropriate risk at incidents. This is a formulation of risk which firefighters describe as providing information to front-line fire crews—it emphasises the role and safety of firefighters—but does not, contra national reviews of the fire service, challenge existing national agreements and working practices. At the time the research was conducted Tactical Information Plans were a tentative and alternative vision to many of the recommendations in the Audit Commission's national review of the fire service, a mid-1990s review which firefighters associated with cost-cutting, the downgrading of working conditions and firefighter safety, and reduction of service provision.

The VMDS is also implicated in the wider problematic of providing fire services at Hereford and Worcester Fire Brigade: the combined authority status, changing station risk classifications and the redeployment of firefighters. The VMDS is drawn upon as integral to the future context of fire service provision, and as part of this, current ambiguities, long-standing tensions and inconsistencies are also deferred to the future development of the VMDS. The future capacities of the VMDS are, to paraphrase Latour, in the hands of a future community.

Chapter 9: Conclusions

- Professor:* 'And you, [to the student] what are you going to do now?'
- Student:* 'I hardly know how to tell you ... Sociology is fascinating, but I think ...'. Then I took the plunge: 'I'm going to be an engineer again, a real one; I'm going to work for a big software company'.
- Professor:* 'Too bad for me, but I suppose it's good for you, it surely pays better', Norbert said in a tone at once bitter and paternal. 'At least you've learned some things you can use, haven't you [...]'
- Student:* 'I'd like, I think, I hope to come across a technological project, purely technological, I'm not sure how to put this, but they've got a really well-conceived project, really doable'.
- Professor:* 'Ah! ah!' Norbert interjected sarcastically. 'So you haven't been immunised? You think Aramis is a special case? That they could have done better? That it's pathological? I've never seen such a stubborn engineer. Aramis died in vain if you think it was a monster. Aramis gave you the best...'
- Student:* 'Stop, stop, no, I'm not abandoning Aramis, and you know why? On the contrary, I'm continuing it. The place where I'm going to work—you'll never guess what they're working on. A huge project to develop an intelligent car.... Yes, it's true—it's Aramis backwards it's technologically perfected; they're spending billions on it'.
- Professor:* 'More than on sociology, I understand. And what's your project called?'

'Prometheus!' So runs the final lines of dialogue in Latour's (1996: 299-300) book *Aramis, Or the Love of Technology*. Aramis was a Parisian urban transport system under development by the public and private sectors in the 1970s that was abandoned in the late 1980s. At the start of the book Latour asks the question: 'Who killed Aramis?'. By the end of the book, Latour suggests that Aramis was abandoned not because of a grand conspiracy but because Aramis was delimited to its technical features and failed to traverse and enact broader preoccupations relating to technological, societal, political and environmental changes. For the purposes of these concluding remarks, the final lines of dialogue between the sociology professor and the engineering student presage the ongoing task for academics to write texts that foster in students, in this instance, a 'love of technologies' which Latour (1996: 298) suggests will mean that 'Aramis won't have died in vain'. In learning to 'love technologies', what is meant by the technology is thoroughly reworked from common-sense assumptions of the 'purely technological', and from Promethean politics.

There remains, to rework Marx, a spectre in relation to the study of information and communication technologies and that spectre is Promethean politics. The naming of a mega-project 'Prometheus' is not coincidental given the myth of Prometheus remarked upon in the first chapter. Technologies remain delimited to tools for 'supporting' and 'facilitating' human actions rather than actors constitutive of new realities where what is meant by the technological, organisation and the human capacities are transformed. Similarly the investment of huge sums of money on large-scale technological infrastructures is unsurprising to those with any familiarity with the recent history of microelectronics and the proliferation of information and communication technologies into the private and public sectors (see, for example, Dutton, 1996; Woolgar, 2002). There remains, then, a lot at stake in our understanding of technology—assumptions that

constitute what technology, organisation and the human mean, and the kinds of resources that are allotted to the development of technological infrastructures.

The stakes also remain high at fire brigades like Hereford and Worcester Fire Brigade and for the provision of fire services across the UK. The *empirical contribution* of this thesis is the exposition of the introduction and use of a mobile incident management system to an under-researched part of the public sector—the VMDS at a UK fire brigade. This has meant, in terms of the empirical analysis in the preceding chapters, not assuming the self-evident presence of the VMDS, but rather analysing how the effects associated with the VMDS are made up of assemblages of heterogeneous materials that are cultural, organisational, technical, historical and professional. It has also meant drawing upon a number of long-standing preoccupations in organisation theory and sociological studies of technology—such as how power is implicated in the relationship between existing practices and new initiatives, the problem of order and disorder, the classification of standardisation and the boundary between organisation and technology—in order to analyse the VMDS-mediated provision of fire services. The first decade of the VMDS in fire service provision is characterised by widespread and increasing implementation to the extent that the VMDS has, at the time of writing, attained a high degree of ‘irreversibility’ (Callon, 1991).⁸⁵ As part of this increasing irreversibilisation, mobile data systems such as the VMDS are becoming a common feature in the provision of fire services and this adds a wider empirical contribution. Unlike the abandoned Aramis, the VMDS has been widely adopted across metropolitan, urban and rural fire brigades. But like Aramis, significant resources, at least in fire brigade terms, have been allocated to the implementation of the VMDS across UK fire brigades, including the recent introduction of ‘new’ ‘second generation’ VMDS at

⁸⁵ Irreversibility is relational and defined as ‘(a) the extent to which it is subsequently impossible to go back to a point where that translation was only one amongst others; and (b) the extent to which it shapes and determines subsequent translations’ (Callon, 1991: 150).

Hereford and Worcester Fire Brigade. There is, then, future research, particularly longitudinal and comparative ethnographic studies, to be conducted on the proliferation and deployment of vehicle mounted data systems across UK fire services.

On 17 October 2002 the Budget Working Party at Hereford and Worcester Fire Brigade set out the cost of implementing the 'second generation' VMDS. The budget for upgrading to the second generation VMDS was calculated at around £250,000 (Budget Working Party, Hereford and Worcester Fire Brigade, 2002: 13).⁸⁶ According to the HMI Inspection Report (2002) the second generation VMDS will enhance the existing system by providing:

the ability to link all types of documents to a premise file e.g., CAD plans, Handbook files, photographs, etc., The ability to load new software programmes i.e., Autodata, which is a vehicle safety databank on any vehicle make or model that will assist crews attending road traffic accidents to make informed decisions on safe places to jack or cut, etc., [plus] map gazetteer, which will enable a countywide street name search [and] improved computer speed and functionality (HMI Inspection Report, Hereford and Worcester Fire Brigade, 2002: 13).

The implementation of this second generation VMDS suggests an empirical basis to analyse technological development as irreducible to singular, one-off events: technology begets technology. Practices of managing and sharing information through 1.(1).D records and paper OS maps were, as Chapter 6 examined, similarly critical for framing the first generation VMDS. It would therefore be a mistake to assume that the analysis of the VMDS set out in this thesis has been overtaken by more recent technological developments—technologies are never discrete objects, analytically and empirically. In analytical terms, technologies are, as previous chapters have set out, relational, material effects, whilst in empirical terms, technologies always presuppose an infrastructure of pre-existing devices and practices in order to be workable. Both the 'first' or 'second' generation VMDS rely upon, for instance, a wide range of other infrastructures and

⁸⁶ The total information technology budget for Hereford and Worcester Fire Brigade is £345,000 (Budget Working Party, Hereford and Worcester Fire Brigade, 2002: 13).

practices such as mapping information from Ordnance Survey and information on patented chemicals.

This thesis has argued for an approach that does not take the ontological status of technology or organisation for granted. Rather it has been argued that the assemblages of heterogeneous materials that constitute what is meant by technology and organisation can become the basis of scholarly inquiry. The *methodological contribution* developed in this thesis centres upon an exposition of organising technology as an ontological activity—what has been termed an ‘ontological turn’. Through an exposition of the implementation and deployment of the VMDS, the ontological turn has been set out as comprising of making determinate and making different. The empirical analysis of the VMDS is invaluable, particularly given the scarcity of research on fire services, but the point of the empirical exposition is to contribute to what Law (2002) terms ‘empirical philosophy’. This denotes the importance of analysing the ontological status of technology and organisation as an empirical phenomenon rather than as something outside of cultural, historical, organisational, technical or professional practices and processes. The methodological implications of this include analysing how technological devices (but also initiatives more generally) become considered to be important and are articulated as necessary, are deployed in use over time, act as performative resources for drawing upon and enacting cultural contexts, and are contextualised and decontextualised through interdependent discursive and non-discursive infrastructures.

The methodological contribution is tightly-coupled with the theoretical contribution of this thesis. As mentioned above, the ‘second generation’ VMDS provides the basis for further and important empirical research (see also Chapter 5, Section 5.6). In these concluding paragraphs, however, I want to set out how the approach to understanding the VMDS developed in this thesis makes a number of *theoretical contributions* to understanding the

relationship between technological, organisational and human capacities, and how this connects to the *politics of theory* more generally. In doing this, analytical points and empirical observations from the thesis are reiterated although this should not be taken to mean a comprehensive summary of the preceding chapters. The concern is, rather, to contribute to

the task of going 'beyond' what history has made of us, to be carried out through the production of new lines of thought and life, [which] does not at all rest on a negation, or disavowal, of history and politics, but rather on a fundamental reconfiguration of them. The aim of this reconfiguration is to open up history and politics ... by showing the vital possibilities of what one might call a rhizomatics of historical time ... and weaves a supple and transversal network of novel alliances that is always perpendicular to the vertical structure of established and official history (Ansell Pearson, 1999: 223).

The contention examined throughout this thesis is that 'going beyond what history has made of us' already occurs when a seemingly mundane device such as a VMDS is introduced into a fire service. This occurs even if research practices have difficulties in documenting such transformations. Providing analytical resources to be able to account for this 'rhizomatics of historical time' is one of the contributions this thesis has attempted to make. In these concluding remarks I want to discuss how empirical insights set out in Chapters 6 to 8 can be articulated in terms of a more general theoretical orientation to the politics of research practice—what Mol and Mesman (1996) describe as 'the politics of theory' and what Mol (1999) more recently termed 'ontological politics'. This means examining how research practices are related to ways of theorising with regard to technology, organisation, and the human, and the relationship between them.

This thesis has been concerned with how technology and organisation become separated at Hereford and Worcester Fire Brigade, and how what is meant by technology and organisation is transformed by the VMDS. This thesis has analysed the VMDS as a relational effect that is aligned with existing boundaries and assumptions at Hereford and

Worcester Fire Brigade, as a multiple object that is a mutable mobile and is deployed not only to manage safety at incidents but also for managing performance and organisational flexibility, and as a device whose instability is responded to ambivalently by actors such as fire crews as they are enrolled in the collective upkeep of the VMDS. This thesis has drawn upon actor-network theory in conjunction with insights from the writings of Deleuze and Guattari but there are, as previous chapters have discussed, also other approaches that claim to account for transformation and question the purified realms of technology and organisation.

Process philosophers in organisation theory have attempted to lay claim to 'being as becoming', and situated studies of organisational practice attempt to recover the interdependencies between rationalistic technologies and situated practices. On process approaches, whilst I am very sympathetic to an emphasis upon transformation as becoming, the argument developed in Chapter 3 was that the vision of becoming set out by process philosophers, in organisation theory at least (see for example, Chia, 1998, 1999, 2003, 2003a; Tsoukas and Chia, 2002; Letiche, 2000; Linstead, 2002), is exceptionally problematic. The ontological assumptions underpinning process philosophy in organisation theory contrast with the ontological turn developed in this thesis in three critical ways.

Firstly, it was argued that it makes little sense to talk of being and becoming outside of cultural, organisational, historical and technical purifications and transformations. In order to argue this Nietzsche, Bergson and Deleuze were examined in conjunction with actor-network theory to set out how forces, whether they are cultural, organisational, technical, historical or professional become *with* the world because they *are* the world and, as such, the world exists as a 'becoming world' constituted by the mediations and purifications of these forces. Second, it was argued that process philosophers, often also drawing upon Bergson, Nietzsche and Deleuze, reintroduce a dualism between transformation as 'pure

becoming' or 'pure difference', and repetition, such as organisational practices, as secondary and solid immobility, and that this is both unhelpful and unwarranted. Chia (1999: 225), for example, writes that 'merely relaxing the deeply entrenched organisational and institutional habits, which keep "organisations" together and which enable them to be thought of as "thing-like", is itself sufficient to allow change to occur of its own volition. It is this "hands-off" attitude towards organisational change which is the implicit advocacy of this process metaphysical mindset'. And more recently, Chia (2003: 111) remarked that 'social reality is always already an abstraction from the brute reality of our pure empirical experience ... what remains absolute is the immediacy of our unthought lived experience'. It was argued that this approach reveals a desire to separate phenomenal experience in a dualistic manner—to valourise the unknowable and uncategorisable as outside of cultural, organisational, political, technical, and historical forces and mediations. This contrasts with the analytical position developed in Chapter 3 and deployed in Chapters 6 to 8 which emphasised the importance of evaluating phenomena in a particular way—recovering foundational causes as relational and heterogeneous effects as a means of opening up the existing state of affairs to something otherwise.

Thirdly, the relationship between being and becoming has been fundamental to philosophical and political thinking in the Western imagination, but the contemporary politics of becoming remains largely neglected by process philosophers, particularly the ways in which the philosophical concept of becoming is rendered complicit with the restructuring of contemporary capitalism around flexible and adaptable network forms of organisation (see Thrift, 1997) and formations of self-hood as agile and fluid in an ever-changing competitive environment (see Heelas, 1996). By contrast it is argued that once the connection is made between politics and philosophy it becomes incumbent to think and act in terms of the politics of theory. Martin (1998: 78), for instance, suggests that once

clear-cut divisions between nature and culture are now in the process of replacement by a quite different relationship in which nature becomes an integral part of culture; she suggests this poses new political questions in relation to the self:

In the aftermath of a weakening of the bounded body and self, what kind of allegiances among people will come into being? I mentioned earlier that people are beginning to treat the person/body as a set of assets.... My question would be: can liquid bodies blurred across time and space belong to 'individuals' in this sense? If parts of the person/body are spread across time and space, which part is the owner? Can there be joint ownership—as in the now familiar form of corporate employee ownership.... On the one hand, obliterating old barriers and divisions among individuals might also remove some forms of oppression and discrimination.... On the other hand ... disaggregated workplaces, families, communities and nation states, fleeting ties to serial co-workers, partners, neighbours and support group members, might enhance the abstract ideals of oneness and purity.

Situated approaches are similarly characterised by the reintroduction of dualistic assumptions. Berg (1997, 1997a, 1998, 1999) provides a review of attempts to intervene in the design, implementation and use of technologies in order to problematise the dualistic assumptions of situated approaches that have attempted to make 'better' technologies by rethinking the processes of technological design and use.⁸⁷ The most prominent attempts to construct better technologies centre around making technological innovation more participatory, that is to say, emphasising the role of those at the front-line who are likely to be responsible for using the technology. This emphasis, which is characterised by various practices to involve the user, comprises, at one extreme, of more 'sophisticated techniques' for managers/experts to capture users' needs through structured meetings and attempts to model workplace activity, to, at the other extreme, a much more explicitly political approach which had its hey-day in the 1970s and 1980s (often described as the

⁸⁷ Sociological studies of technologies have done a great deal to demonstrate the contingencies of technological development, adoption and, to a lesser extent, the consumption of artefacts (for a review see McLoughlin, 1999). Despite the detailed empirical basis of much of the research in this tradition, by its own terms of success, experiments in constructing 'alternative technologies' have often failed (see for example, Ehn et. al., 1981 in Scarbrough and Corbett 1992), and relatively little has been achieved in influencing technologically-mediated change in the longer term, even if this has been the explicit purpose.

'Scandinavian tradition').⁸⁸ The interest in the latter approach was in 'alternative technologies' that were not the materialisation of management interests and did not reproduce management control of labour process (for a review see Scarbrough and Corbett, 1992: 49-68; see also Garrety and Badham, 2000).⁸⁹

This thesis has been concerned with an analysis of the uses of the VMDS at Hereford and Worcester Fire Brigade—a methodological approach, focus and site of research for which there is, as mentioned above, little scholarly interest at present. In addition to this empirical contribution, detailed empirical studies of organisational activity that have been undertaken have often emphasised the situated character of the use of information and communication technologies (see for example, Orr, 1996; Suchman, 1987; Winograd and Flores, 1986). As a precursor and contrast to the politics of theory related to the ontological turn, it is useful to remark upon underlying ontological assumptions of empirical studies that foreground situated practices (see also Chapter 3, Section 3.6).

Within the fields of computer-supported cooperative work and human-computer interaction, Winograd and Flores (1986), Winograd (1995), Flores (1998), Heath and Luff (2000) and Suchman (1987) amongst others have been influential in developing the approach that focuses upon the situated actor and action. Drawing upon ethnomethodological insights, Suchman (1987), for example, sets out how 'plans' are often assumed to be the basis of 'purposeful action' by those designing large-scale information

⁸⁸ The preoccupations of the Scandinavian tradition were also evident for those researching organisations in the late 1970s and early 1980s, with social psychologists, sociologists and researchers of industrial relations studying initiatives to improve the Quality of Working Life through job enrichment and experiments with Industrial Democracy. These included applying socio-technical principles to autonomous work groups in Swedish car and truck factories (see Blackler and Brown, 1978; Berggren, 1993), introducing employees/union representatives onto the board of the UK Post Office to democratise the structure of decision-making (see Batstone et al., 1983), and attempts to rework the hierarchy between external expertise and internal situated knowledge through joint problem-solving initiatives.

⁸⁹ It is worth noting that emphasis upon engaging front-line fire crews in the development of the VMDS was negligible in terms of structured meetings and attempts to capture work practices, and non-existent with regard to fostering an 'alternative technological infrastructure' as in the Scandinavian tradition.

infrastructures. In contrast to the assumptions of the rationalistic approach, plans are more like 'resources for situated action, but do not in any strong sense determine its [action's] course'. This means that 'the operational significance of a given procedure or policy on occasions is not self-evident, but is determined ... with respect to the particularities of the situation at hand' (Suchman and Wynn, 1984: 152). More recently, organisational researchers have also laid claim to an interest in situated accounts of organisational practices, with Tsoukas and Chia (2002), for example, attempting to conjoin process philosophy with situated action (for a discussion see Chapter 3). Others that emphasise organisational practices and situated action include, for example, Brown and Duguid (1991), Hatch (1999), Orlikowski (1996) and Weick (1993, 1999). More generally, the preoccupation with a situated understanding of knowledge production and consumption has also been taken up across the social and natural sciences with the emphasis upon a movement from 'Mode 1' knowledge, that is, top-down, disembodied and rationalistic knowledge, to 'Mode 2' knowledge as situated, distributed and multi-disciplinary knowing (see Gibbons et al., 1994). This turn to situated approaches in studies of organisation and the production of knowledge more generally is, then, becoming something of an orthodoxy as it becomes institutionalised in various fields of study.

The implications for research practice of theorising the gap between rationalistic design and situated use has often focused upon the clarion call for researchers to come out of the academy or the laboratory and become ethnographers; the emphasis here is upon studying work in order to recover the rich practices involved in getting a job done (see Schmidt and Bannon, 1992). Focusing upon detailing the fine-grain of workplace practice will, according to the situated approach, foster 'better technologies' because decisions around technological development have taken account of how users undertake their work. On this level of analysis, a situated approach has important insights that cannot easily be argued

against. An ethnography of fire crews' practices before the VMDS was implemented could have made insightful contributions; it would, for example, have articulated how fire crews coordinate themselves on a collective basis on the way to incidents, and made visible the potential for spatial and temporal compression with the fixing of VMDS screens to the fire appliance dashboard. Nonetheless, following Berg (1998, 1999), my analytical concern with the situated approach is that, however seductive the argument for a situated approach is for those interested in developing and using technological infrastructures, the ontological divisions between technology, organisation and the human remain intact and 're-enter the debate' in under-acknowledged ways.

Berg (1998: 467-68) describes how the situated approach conceives of 'traditional system design' as a precursor to problematising its underlying ontological assumptions:

Traditional system design ... mistakenly sees human work as describable by the logic that belongs to the realm of technology: as consisting of clear-cut, well-circumscribed tasks, executable in a predictable and pre-designed sequence.... Traditional system design does not see that work is performed according to a fundamentally different logic: a logic of fluid interaction, of situated action, of local circumstance.

Given this 'traditional system design', the appropriate role for technologies and the way to foster better technologies is to configure infrastructures to accommodate creative human activity. The underpinning assumption here is that rationalistic-inspired designers of technological infrastructures have failed to recognise the ontological difference between the technological and the human—those responsible for constructing information and communication technologies have assumed that human activity follows the mechanical and instrumental logic of technology. Berg (1998) suggests that from this underlying assumption there can be either negative or positive visions of technology. Negative visions construe technology as 'being "authoritarian", "impoverished" and "mechanistic"' (Berg, 1998: 469), and from this comes the conclusion that 'the only proper technology is no

technology', or minimally specified technology that can be reconfigured by the user. The implication here is that technological infrastructures including the VMDS should intervene as little as possible in work practices because they are an obstruction. Positive visions of technological infrastructures, by contrast, suggest that neither restrictive technology nor skilled users can work without one another but that the two are interdependent. Here technological infrastructures in fact support situated use because they are resources for social action and improvisation. There is, however, little explicit sense of how technology is an active part of organisational practices because technologies are boundary objects that are the outcome of human actors' projections and the attribution of meanings by multiple constituencies (see Star and Griesemer, 1989).

It is my contention that the situated critique of rationalistic assumptions falls short of a radical rethinking of the relationship between technology, human capacities and organised contexts in a number of critical respects. Firstly, situated approaches are significantly delimited to a preoccupation with reducing the rationalistic emphasis and foregrounding the importance of contextualised practice (see also Flyvbjerg, 2002). There is, in crude terms, either more rationalist techniques and less situated activity or vice versa, and situated approaches remain caught up in this form of analysis and debate. Secondly, although situated human capacities and rationalistic technological infrastructures interact, the kind of interaction is one that reaffirms the ontological divides between the humans, technologies and organisations. The maintenance of a dualism between humans and technologies leads to a circumscribed politics of research that is concerned with questions of more or less user involvement, or increasing or decreasing flexibility, skill or centralisation related to a particular technological infrastructure. In addition, methodological interventions are delimited because once the normatively 'right' set of procedures are put in place to, for instance, recover users' needs, there is little basis for

contesting the effects of a 'user-centred' technology. Thirdly, because the interaction between human and technological capacities is unproblematised each 'remains active according to the logic of their own realm' (Berg, 1998: 473). This means that technologies remain associated with mechanical and humdrum tasks and humans with lucid interpretation and improvisation—a contemporary reanimation of Promethean politics.⁹⁰ The result is a circumscribed space for the analysis of the delegation of capacities across ontological boundaries, for rhizomatic movement and the transformation of what technology and organisation mean.

This thesis has attempted to demonstrate that there are different ways of thinking through the *politics of theory*, other questions to be posed and other political commitments related to different ways of theorising the relationship between the technological, the organisational and the human. The argument set out in this thesis is that human capacities are constituted by an 'original technicity' (see Beardsworth, 1996, 1998, 2001; see also Chapter 3). This 'technicity' includes the under-acknowledged role of mobile data systems such as the VMDS at Hereford and Worcester Fire Brigade. The relational capacities of subjects and objects is also Cooper's concern (1998) who, in an extended interview, describes what he considers to be the restricted anti-intellectualism upon which much organisational analysis remains premised. Cooper (1998a: 151-52; see Cooper, 1976) describes his early research experiences and expresses the hope for an enlarged social theory for studying organisation:

The 'Open Field' essay was a very personal expression of my general reflection on the social sciences and their theoretical and practical relevance.... For some years I collaborated with the Tavistock Institute of Human Relations in London on its

⁹⁰ Maintaining the ontological divide between technological impact and human action is important for the adoption of situated approaches by those charged with developing information and communication technologies. A situated approach admits 'the human dimension' or 'managerial issues' into the technical development process, but maintains the professional domain of technical development and simultaneously relegates 'the human dimension' to a role that informs the use of 'hardware'—ontological divides between the neutral character of technology and the biased human interests are, then, maintained and renewed.

Industrial Democracy programme. The Tavistock researchers had been developing action-oriented theory and consultancy in industry and the community for some years.... But I was personally dissatisfied with both social science theory and change programmes.... that it was too limited in its conception of the human world, that it was overly normative and too irreflective to do more than represent a conventionally restricted view of the world.... Philosophy and literature addressed the imagination and the domain of the spirit—vital features of the human community—while social science seemed not to admit these are defining criteria of social and cultural life. I wanted to open up social science to neglected and excluded possibilities, to draw attention to the dereliction of intellectual duty, to its lack of vision, to its limiting positivism and its squeamish obeisance to the mundane.

Cooper continues that the world is not just available as an anthropomorphic object—as a ready-made entity with fixed capacities—and that the social sciences have hardly started to consider the implications of studying social and organisational activity in ways that do not discern objects as mechanical and predictable entities and subjects as creative and situated improvisers. Opening up social science to neglected and excluded possibilities requires the problematisation of a transparent divide between subjects and objects, and an emphasis upon the ‘labour of division’ (Cooper, 1997) that constitutes objects and subjects in the first instance and then tries to reconnect divided actors.

Burrell and Morgan (1979) are similarly interested in the ‘politics of theory’ and in the ontological status of organisations. Burrell and Morgan (1979: 401), like Cooper, conclude that there is a ‘relatively narrow piece of ground which organisation theorists, along with many other groups of social scientists, have thus far tilled’. They write that:

The ontological status of organisations is a question worthy of investigation. Organisation theorists frequently treat the existence of organisations in a hard, concrete sense as taken for granted.... The notion that one can measure an organisation as an empirical facticity is as extreme as the notion that organisations do not exist. It is awareness of these extremes that underwrites the importance of examining the ontological status of our subject of study (Burrell and Morgan, 1979: 398).

Following on from the preoccupations of Cooper, Burrell and Morgan and others (for example, Brown et al., 1998; Lee and Hassard, 1999) this thesis has developed a particular

approach to understanding the ontological status of technological devices such as the VMDS, of organisation and human capacities more generally. I have described this as an 'ontological turn' in the study of organisation and technology. It has been argued that this entails providing both a critical account of the current articulations of process philosophy and of situated approaches through the analytical position and 'empirical philosophy' set out in this thesis. It has been argued that both these approaches reinstate a dualism between, in process approaches to organisational analysis, 'pure experience' and 'intellectual abstraction'; and, in situated accounts, 'mechanistic technologies' and 'socially distributed' improvisation. Drawing upon insights from actor-network theory and concepts from Deleuze and Guattari, the approach in this thesis has been to develop a non-essentialist 'ontological turn' to the study of technology and organisation. This ontological activity is comprised of activities of differentiation, which has been examined in terms of problematisation and making determinate, and differentiation, which has been discerned as translation and transformation. The ontological turn demonstrates that what the VMDS becomes at Hereford and Worcester Fire Brigade is comprised of organisational, historical, professional and technical mediations and purifications.

The VMDS at Hereford and Worcester Fire Brigade is bound up with reality constituting effects. This means that a critical and creative politics of theory must work through the world-making capacity of devices such as the VMDS. The VMDS described in this thesis is an entity whose ontological status is not determined *a priori* but is rhizomatic, where 'the mingling of diverse actants results in a new world in which technologies and human actors acquire their specific characteristics' (Berg, 1998: 476; 1999). With the introduction of the VMDS and the Operational Intelligence Unit, the management of records and the criteria for inclusion of the list of risk records held on the VMDS changes, but not because this was predetermined by the VMDS. In a number of respects VMDS records are similar to those of

the previous paper-based records, but with the brigade-wide management of information we have to ask what is meant by—what is the contemporary reality of—brigade hierarchies, standardised practices, communication between stations, risks to firefighters and the boundaries of the brigade in the face of potential regionalisation. Issues of hierarchy, for instance, become connected to the ‘internal objectivity’ of the Operational Intelligence Unit, and standardisation becomes associated with the management of information and not only with fire crews’ working practices. In terms of hierarchy and internal objectivity, the delegation of responsibility to officers using the VMDS at incidents and the reliability of information held on the VMDS is likely to become increasingly important and the subject of future controversies, particularly when the distribution of responsibility is at stake (for example, injuries to firefighters and the public, speed of response of fire services and decisions about competent fire service provision). The information held on the VMDS can be understood as becoming part of the future organisation of fire services as much as it can be understood as a historical archive of past decisions and practices.

There is, then, not so much the question of increases or decreases in hierarchy, information, standardisation and risk as translated articulations of what are meant by hierarchy, information, standardisation and risk. Universal access to information does not simply mean the devolvement of information to fire crews or that the new information management practices at the Operational Intelligence Unit can be understood only in terms of centralisation. Instead of greater or lesser devolvement and the concentration or distribution of activities for managing information, reporting on performance or measuring risk, what is meant by information and measurable performance is transformed and this marks out the ontological work that constitutes new subjects and objects (see also Berg, 1997, 1998, 1999). There is, in other words, a becoming-VMDS-of-information and a becoming-risk-of-the VMDS.

It has been argued that there is a mutual transformation of the VMDS, introduced initially to rectify the lack of ‘the right information at the right place at the right time’, and the organisation of fire services. This emphasis upon translation/transformation marks out how it is the ontological status of actors that is the issue at stake. Technologies such the VMDS ‘alter, twist and transform what they “carry”’ (Berg, 1998: 478), that is to say, the VMDS is involved in reworking what is understood by the provision of fire services, including what is meant by front-line information, fire stations and fire appliances, mobile incident management and fire crew safety and risk. The VMDS is, then, a multiple, ‘unfinished’ object rather than a stand-alone set of screens. This means that a theoretically-driven politics of technology cannot be delimited to questions of the existence or non-existence of *a priori* and determinate effects.

This then is a different place to begin scholarly activity and another kind of politics. It is a politics of theory that is premised upon a non-essentialist ontology and an enduring scepticism of the predetermined impacts of technologies such as the VMDS. It affirms Burrell and Morgan’s (1979: 401) contention that ‘the path to the future is wide open’. The task of articulating what researchers are ‘working on’ similarly cannot be drawn together into a final closure or into a definitive form of organisation nor should this be attempted. In concluding this thesis I wish to suggest that focusing upon the ontological status of technologies such as the VMDS is an endeavour that is currently worth pursuing because of the new dimensions to politics it helps to open up—dimensions of a politics that emphasise how technologies are political actors, how ongoing deployment of a technology cannot be predicted in advance and how judgements are made when constituting ontological boundaries between technology and organisation. Researchers would, I think, remain faithful to a long intellectual tradition and a sense of critical and creative political commitment if they noticed, engaged and helped to construct the heterogeneous ways in

which technological devices such as the Vehicle Mounted Data System transform what organisation theorists understand by and what counts as organisation.

Appendix 1

Table 1: Latour's (1993: 141) Modern and Nonmodern Constitution

Modern Constitution

1st guarantee: Nature is transcendent but mobilizable (immanent)

2nd guarantee: Society is immanent but it infinitely surpasses us (transcendent)

3rd guarantee: Nature and Society are totally distinct, and the work of purification bears no relation to the work of mediation

4th guarantee: the crossed-out God is totally absent but ensures arbitration between the two branches of government

Nonmodern Constitution

1st guarantee: nonseparability of the common production of societies and natures

2nd guarantee: continuous following of the production of Nature, which is objective, and the production of society, which is free. In the last analysis, there is indeed a transcendence of Nature and an immanence of Society, but the two are not separated

3rd guarantee: freedom is redefined as a capacity to sort the combinations of hybrids that no longer depend on a homogeneous temporal flow

4th guarantee: the production of hybrids, by becoming explicit and collective, becomes the object of an enlarged democracy that regulates or slows down its cadence

Appendix 2

Table 1: Total Number of Incidents, 1995-1998 (England and Wales)

Type of Incident	1995	1996	1997	1998
Fires	516,200	444,900	397,600	345,700
Fire false alarms	446,900	430,000	430,300	397,500
Special service incidents ⁹¹	185,800	186,000	163,600	158,000
Total incidents	1,148,900	1,060,900	991,500	901,200

From: HM Inspectorate, Chief Inspector, 1999-2000.

Table 2: Breakdown of Fire Service Expenditure, 1998-1999

	Amount (£m)	Percentage
Wholetime firefighters' salaries	822	55
Pensions	205	14
Retained firefighters' salaries	66	4
Civilian salaries and wages	104	7
Control room salaries	36	2
Other employee costs	32	2
Running costs	225	15

From: HM Inspectorate, Chief Inspector, 1999-2000.

⁹¹ Special service incidents include road traffic incidents, flooding, chemical spills, etc.

Table 3: Structure, Management and Roles of the Fire Service in England and Wales

Secretary of State

Function: government policy and strategic direction; fire service funding; approval to reduce operational capacity; terms of firefighters' pension scheme.

HM Fire Service Inspectorate

Function: to provide advice to Ministers fire brigades and local authorities; to inspect the activities of fire brigades; Best Value Inspectorate. Government coordination through HMFSI, with an expansion of the HMFSI from point of delivery inspections to Best Value, preventing fire, etc., over the last two decades (see Baigent, 2001).

Central Fire Brigades Advisory Council

Function: a forum for the fire service stakeholders to reach consensus on major policy issues and to provide advice to the Secretary of State. Members: the Minister, Office of the Deputy Prime Minister (ODPM), Her Majesty's Fire Service Inspectorate (HMFSI), Local Government Association (LGA), Fire brigades' union (FBU), Retained Firefighters Union (RFU), Chief and Assistant Chief Fire Officers' Association (CACFOA), Chief Fire Officer London and Chairs of Advisory Boards.

Central Fire Brigades Advisory Council (CFBAC)

Function: to provide advice to the CFBAC and take forward work programmes approved by Ministers and CFBAC. Boards: fire safety, integrated personal development, fire risk management, equality and cultural change, health and safety, and related bodies.

National Joint Council for Local Authorities' Fire Brigades (NJC)

Function: on behalf of the fire authorities in the UK, negotiate pay and conditions of service, excluding pensions. Provides disputes machinery. Members: local government authorities (LGA), the fire brigades' union (FBU) and Chief and Assistant Chief Fire Officers' Association (CACFOA) for senior officers' pay and conditions.

Fire Service College

Function: to provide management and specialist training courses for the fire service.

Fire Authorities

Function: the fire brigades' formal employer, responsible for funding, budget setting, staffing, policy, direction on initiatives, decisions on standards of fire cover. England: 47 fire authorities. Wales: 3 combined authorities.

Fire Brigades Stations

Function: to organise and oversee the delivery of the service. Often 'placed in town centres as showpieces' (Baigent, 2001: 5).

Fire Stations, Rank Structure and Watches

Stations: 595 wholtime fire stations, 874 retained stations, 115 day manning stations, 49 control rooms. Rank structure and single tier entry promotion: firefighter, leading firefighter, Sub-Officer, Station Officer, Assistant Divisional Officer, Divisional Officer Grades I, II and III, Senior Divisional Officer, Assistant Chief Officer, Chief Fire Officer. Watches: firefighters are permanently attached to one of four watches (Red, White, Blue and Green watch). Watches provide continuous firefighting cover within a nationally agreed watch system. Watches comprise of operational duties (i.e., attending incidents), standing-by duties (training, maintaining equipment, 1.(1).D inspections, etc.) and standing-down duties (i.e., requirement to attend emergencies/'shouts' but no other duties, e.g., overnight).

Fire brigades' union (FBU)

Function: represents wholtime/full time firefighters. Member of the National Joint Council.

Retained Firefighters' Union (RFU)

Function: represents retained/part time firefighters.

Adapted and extended from Bain et al., (2002: 27).

Table 4: Fire Cover Categories, Type of Building and Property

A	Largest cities and towns: includes main shopping and business centres, concentrations of entertainment complexes and high risk industrial property.
B	Larger cities and towns that are not category A: includes smaller-scale shopping and business centres, concentrations of hotels and older multi-storey residential buildings and industrial and trading estates with some high-risk buildings.
C	Suburbs of large towns and smaller towns with substantial built up areas of substantial size: includes post-War housing developments (terraced and multi-storey housing), blocks of flats, semi-detached and detached residential housing.
D	All other categories excluding Remote Rural that is not A, B or C.
Remote Rural	Areas isolated from centres of population with few buildings.
Special Risks	Subsidiary category for small areas (either single buildings or complexes) which need a first attendance over and above that appropriate for the risk in the surrounding area: includes hospitals, prisons, airports, tower blocks and major petrochemical plants.

From: Audit Commission (1995: 13) and Bain et al., (2002: 17).

Table 5: National Response Standards, Risk Categories and Fire Crew Levels

Risk category and crew	Number of fire appliances	Attendance times and fire crew levels		
		1st	2nd	3rd
<i>A</i> (wt)	3	5 mins (5) [3]	5 mins (4)	8 mins (4)
<i>B</i> (wt)	2	5 mins (5) [2]	8 mins (4)	
<i>C</i> (wt/day/retained)	1	8-10 mins (5) [1]		
<i>D</i> (wt/day/retained)	1	20 mins (5) [1]		
Remote Rural	No national recommendation			
Special Risks	No national recommendation			

Notes:

wt: wholetime
 day: day crewed
 retained: retained crew
 () number of crew
 [] number of appliances for first attendance

From: Audit Commission (1995: 14) and Bain et al., (2002: 18).

Table 6: Changing Levels of Risk

Risk Category	Percentage of National Area Within Each Category				
	<i>1983</i>	<i>1988</i>	<i>1983-88+/-</i>	<i>1993</i>	<i>1988-93+/-</i>
<i>A</i>	0.4%	0.6%	0.2%	0.3%	0.3%
<i>B</i>	3.5%	1.4%	-2.1%	1.0%	0.4%
<i>C</i>	13.9%	7.3%	-3.0%	7.0%	0.3%
<i>D</i>	82.2%	79.2%	-3.0%	83.8%	4.6%
<i>Remote Rural</i>	N/A	11.5%	11.5%	7.9%	3.6%

From: CIPFA statistics quoted in Audit Commission (1995: 48) in Stirling and Fitzgerald (1997: 6).

Appendix 3

Table 1: Specification for the Vehicle Mounted Data System

- The system should be able to store in excess of 2,000 premises records in the crew cabs of fire appliances.⁹²
- The information should be readily available to crews, prior to arrival at an incident so that they have sufficient information before they are faced with the hazards.
- The information should be provided in such a way as not to overload the officer with facts early in the incident by providing tactical and strategic levels of data.
- Sufficient copies of the information are required to issue to specialist officers and to other agencies sharing hazards of the fire ground (e.g., police, other brigades).
- The complete system must be able to be updated easily using the minimum of resources.
- Because of the sensitive nature of some data the system should be secure so as to prevent unauthorised access to privileged information (e.g., plans of banks, military installations, etc.).
- The system should be user friendly to encourage officers to access it.
- The system should allow management to check and confirm that information is being used.
- The system should be such that brigade management are confident that all copies of the information are identical.
- The system should be maintainable as a 'quality system' providing management with the ability to access audit trails and provide accountability and traceability for all actions and decisions.

(Source: O'Dwyer, 1996: 33-34).

⁹² A later reappraisal of the functional capability of the VMDS 'confirmed that there is sufficient space on each 1.3GB hard disk to store TIP [Tactical Information Plans] and secondary information in excess of 4,000 premises, keep copies of all operational procedures and the officers' handbook, store full chemical hazard information on in excess of 115,000 chemical references ... and still have sufficient free space to maintain copies of maps for the whole county including overlays of informative details ... such as water sources, hydrants and significant features' (Goodwin, 1997: 40). At the time of the research 189 risk records were held on the VMDS (Operational Intelligence Unit, CRR File Index, Issue 7, July 1997). The number of risk records (189) is under 5 per cent of the technical capacity of the VMDS as set out by Goodwin (1997).

Table 2: Research Sites at Hereford and Worcester Fire Brigade

Station 1 (Worcester)	Crewed 24 hours a day by four watches (Red, White, Blue, Green) with 18 firefighters on each watch. Thirteen retained firefighters act as a back-up to the wholetime fire crews. The station is comprised of three fire appliances and one specialist turntable ladder and equipment to deal with river rescues and flooding incidents.
Station 2 (Hereford)	Crewed 24 hours a day by four watches (Red, White, Blue, Green) with 14 firefighters on each watch. Twelve retained firefighters act as a back-up to the wholetime fire crews. The station is comprised of two fire appliances and specialist equipment including one rescue appliance, one turntable ladder, one water carrier and an inflatable boat.
Station 3 (Bromsgrove)	Crewed 24 hours a day by four watches (Red, White Blue, Green) with 10 firefighters on each watch. The station is comprised of one fire appliance and specialist equipment including one hydraulic platform and two water carriers.
Station 4 (Kidderminster)	Crewed 24 hours a day by four watches (Red, White, Blue, Green) with 18 firefighters on each watch. Fifteen retained firefighters act as a back-up to the wholetime fire crews. The station is comprised of two fire appliances and one water carrier.
Station 5 (Droitwich)	Day crewed station with 16 firefighters divided between two watches (1st and 2nd watch) each with eight firefighters. Retained firefighters are also on call throughout the day and night. The station is comprised of one fire appliance, one water ladder and specialist equipment including an incident support unit.
Operational Intelligence Unit	Support unit responsible for managing risk assessment, updating the VMDS and provide brigade-wide support for stations.
Command and control Centre	Responsible for receiving emergency 999 calls, mobilising crews and providing information to fire crews at incidents and for communications between emergency services.
Headquarters	Comprises of senior officers, plus personnel, finance, IT management, procurement and administrative support.

Table 3: Incident Statistics for Hereford and Worcester Fire Brigade, April 1999-March 2003

Station	FDR1 ⁹³	Secondary ⁹⁴	Chimney	FAM ⁹⁵	FAGI ⁹⁶	FAA ⁹⁷	SS(E/NE) ⁹⁸	Total
1	1302	1166	52	317	792	2178	1308	7115
2	852	747	88	189	487	1014	739	4143
3	682	492	28	115	426	632	734	3109
4	812	1115	33	274	460	1014	921	4626
5	349	220	29	76	296	473	448	1891

From: Hereford and Worcester Combined Fire Authority, Draft Integrated Risk Management Plan, (2003: 44)

⁹³ FDR1: fires that occur in premises of value including private dwellings, commercial premises and vehicles.

⁹⁴ Secondary: fires that occur in rubbish skips, bonfires, grass, etc.

⁹⁵ FAM: calls made with the intention of getting the brigade to attend a non-existent fire related event.

⁹⁶ FAGI: calls made in good faith in the belief the brigade would attend a fire.

⁹⁷ FAA: calls initiated by fire alarm.

⁹⁸ SS(E) and SS(NE): special service calls of an emergency nature e.g., persons trapped in a car after an accident, and non-emergency e.g., locked out of dwelling.

Appendix 4

Plate 1: A5 Size Risk Card, (Pre-A4 084/1.(1).D Risk Card), Used in the Early to Mid 1980s by Fire Crews, Amended to Make Partially Anonymous, Personal Archive of Former Sub-Officer, Hereford and Worcester Fire Brigade's Headquarters.

RISK CARD			
LOWER WICK HOUSE			
RISK	LIFE.	TRADE OR BUSINESS	RESIDENTIAL SCHOOL
ADDRESS	LOWER WICK HOUSE MALVERN ROAD WORCESTER.	CONTACT	WARDEN
		KEY HOLDER	AS ABOVE.
ROUTE FROM NEAREST MAIN ROAD	New Road, St. Johns, Malvern Road, 27 m. past Sherwood		
HAZARDS	PROPERTIES	LOCATION	ACTION
NIL			
ATTENDANCE	WRL 21	WRT 21	MAP REFERENCE

Plate 2: A5 Size Risk Card, (Pre-A4 084/1.(1).D Risk Card), Used in the Early to Mid 1980s by Fire Crews, Amended to Make Partially Anonymous, Personal Archive of Former Sub-Officer, Hereford and Worcester Fire Brigade's Headquarters.

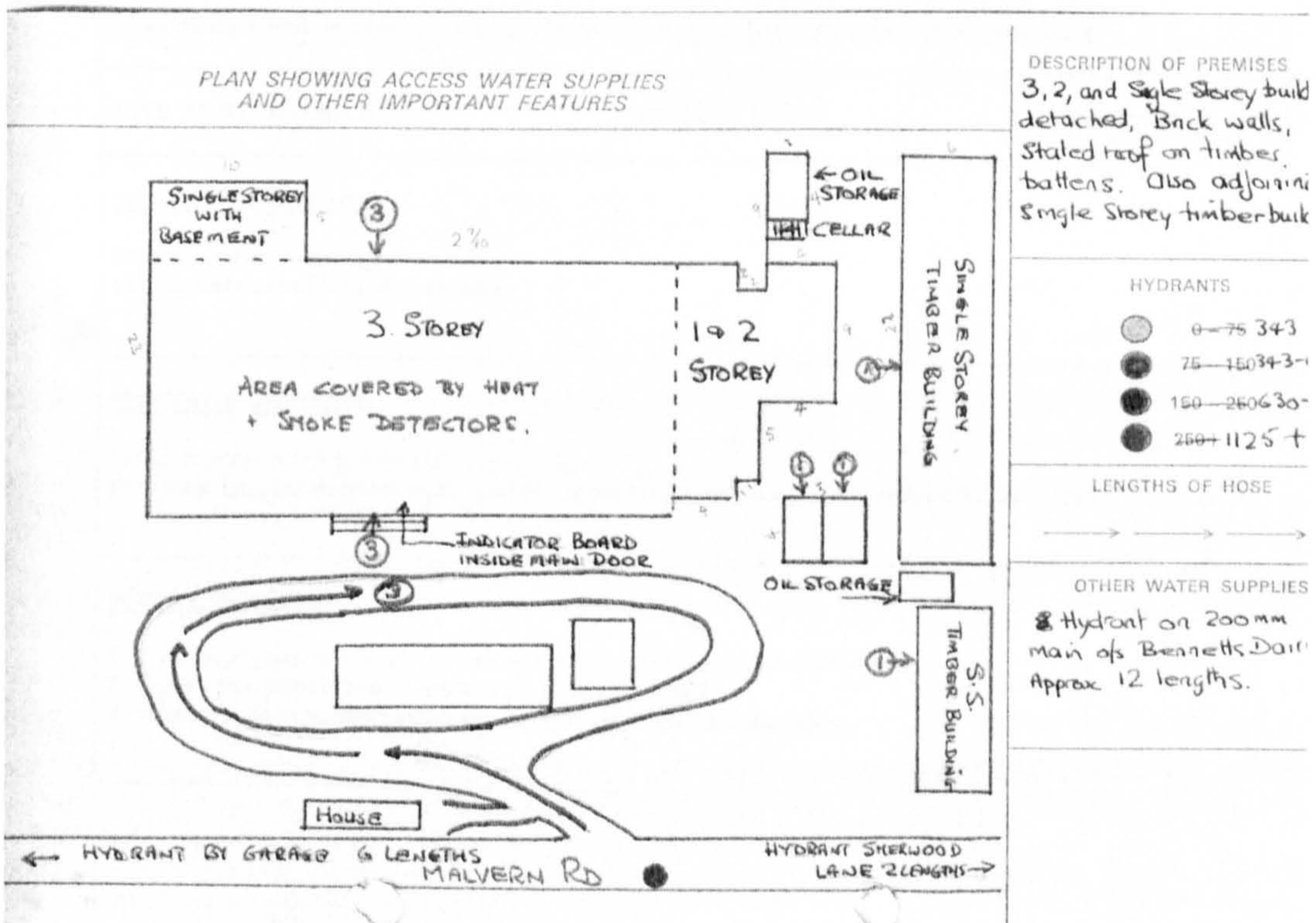
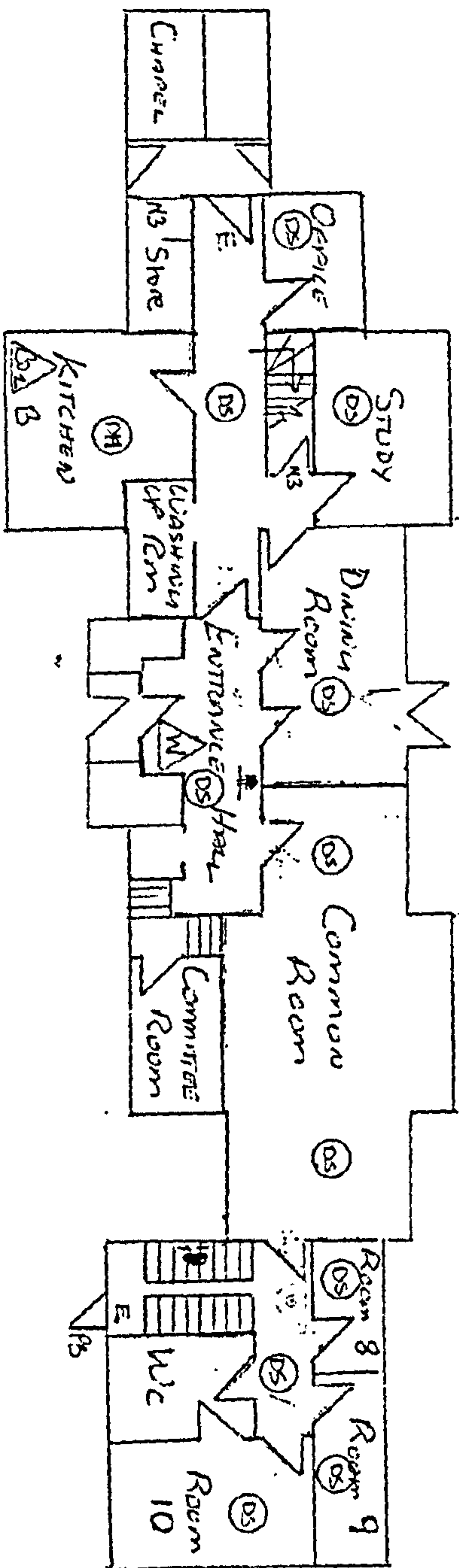


Plate 3: Paper Based 1.(1).D/A4 Risk Record, Hereford and Worcester Fire Brigade, Used by Fire Crews Prior to VMDS Implementation, Amended to Make Partially Anonymous, Personal Archive of Former Sub-Officer, Hereford and Worcester Fire Brigade's Headquarters.

084

1 (i) (d) SPECIAL RISK SHEET NO.		084/2577
ADDRESS: Barns Close Money Lane Romsley	DATE ISSUED:	
	MAP REF:	
P.D.A: 2 WRL WRC		
CONSTRUCTION: Traditionally built brick construction with multi-pitch traditional tiled roof. 30m x 10m x 3 storeys high with new 10m x 10m brick built extension that is only 2 storey. Brick partition walls throughout with lathe and plaster board ceilings and traditional wooden floors.		
LIFE RISK: Students & Staff	BY DAY: 20-40	BY NIGHT: 20-40
DETAILS OF HAZARDS: Students and staff sleeping on premises. LPG Cylinders outside kitchen entrance.		
SPECIAL FEATURES: Difficult access for large appliances, narrow lane. Poor water supplies therefore water must be supplied from hydrant at bottom of drive by M5 bridge.		
WATER SUPPLIES: 1. Hydrant in grass, next to drive, front corner of house (extremely low flow). 2. Open water: pond at rear of house approximately 10,000L. 3. Hydrant sited in Money Lane, side of motorway bridge for water relay.		

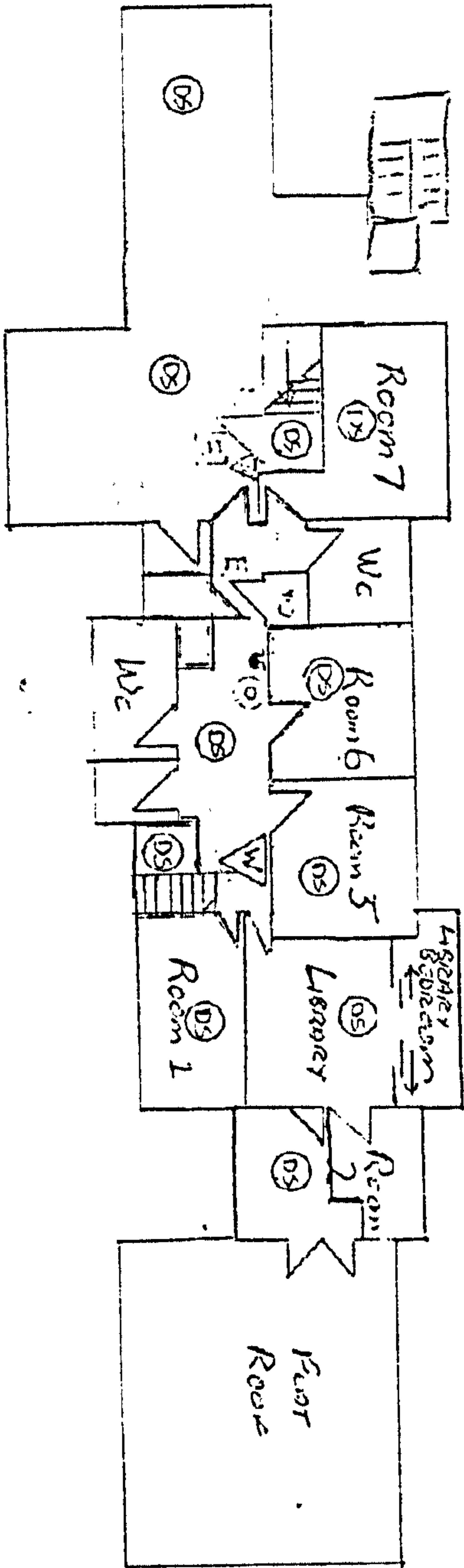
INSTITUTIONAL PREMISES



GROUND FLOOR

JUSTITIA Principis

FIRE ESCAPE
FROM FLAT.



First Floor

Handwritten notes in the left margin, including a small sketch of a staircase and some illegible text.

Full Survey Plans
13-11-91

Appendix 5

Plate 1: VMDS Tactical Information Plan/Risk Record, Hereford and Worcester Fire Brigade, October 1996. Printout of VMDS Record Used by Fire Crews, Amended to Make Partially Anonymous, Courtesy of Hereford and Worcester Fire Brigade (see appendix 4 for pre-VMDS 1.(1).D risk records).

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ADDRESS

vvvccs.

OTHER INFORMATION

AREA - Stn 25
CRR NO. - 25AA024
MAP REF. - 395909 270651
PDA - 2 Appliances

DIRECTIONS

From Stn 25 - turn left into Windsor Street and then right at 'T' junction down to High Street. Bear left and Bayliss is on the left next to the "Golden Cross" Public House.

From A38 (South) - take left at roundabout into Bromsgrove, down into town to first roundabout and right into Market Street. First right into St Johns Street, bear left into High Street and Bayliss is on the right next to the "Golden Cross" Public House.

INFORMATIVE MESSAGE

Terraced building of 4 floors, 10 x 30m used as retail premises
(State location, type, and size of incident together with equipment used)

SIGNIFICANT HAZARDS

Storage of large amounts of beds & soft furnishings
Voids & cavities present in building structure

SITE LOCATION PLAN

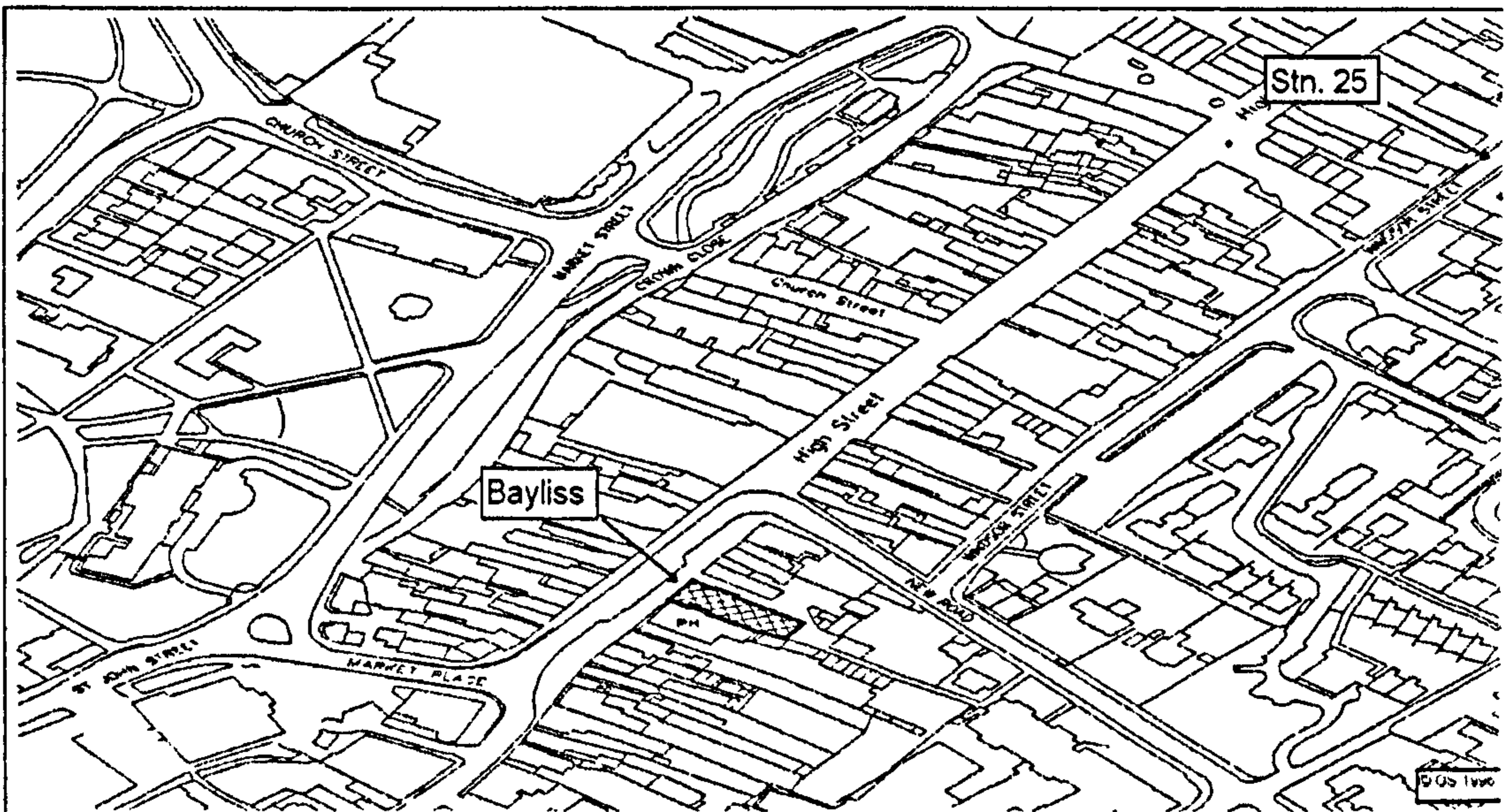


Plate 2: VMDS Tactical Information Plan/Risk Record, Hereford and Worcester Fire Brigade, October 1996.

POTENTIAL RISKS

- | | |
|--|--|
| <ul style="list-style-type: none"> • Building collapse due to fire loading & construction • Air exhaustion of BA sets due to heavy smoke logging | <ul style="list-style-type: none"> • Flashover due to fireloading & compartment size • Backdraught due to fireloading • Struck by objects due to suspended ceilings |
|--|--|

CONSTRUCTION

- | | |
|---|---|
| <ul style="list-style-type: none"> • Traditional brick Exposed timber beams & columns in parts | <ul style="list-style-type: none"> • Suspended ceilings ground & first floors • Voids between floors & ceilings |
|---|---|

WATER SUPPLIES

100mm corner High Street / New road;	200mm outside Post Office in High Street
--------------------------------------	--

CONSIDERATIONS / FEATURES

- | | |
|---|---|
| <ul style="list-style-type: none"> • Traffic congestion to front & rear of building during day | • |
|---|---|

SITE/BUILDING PLAN

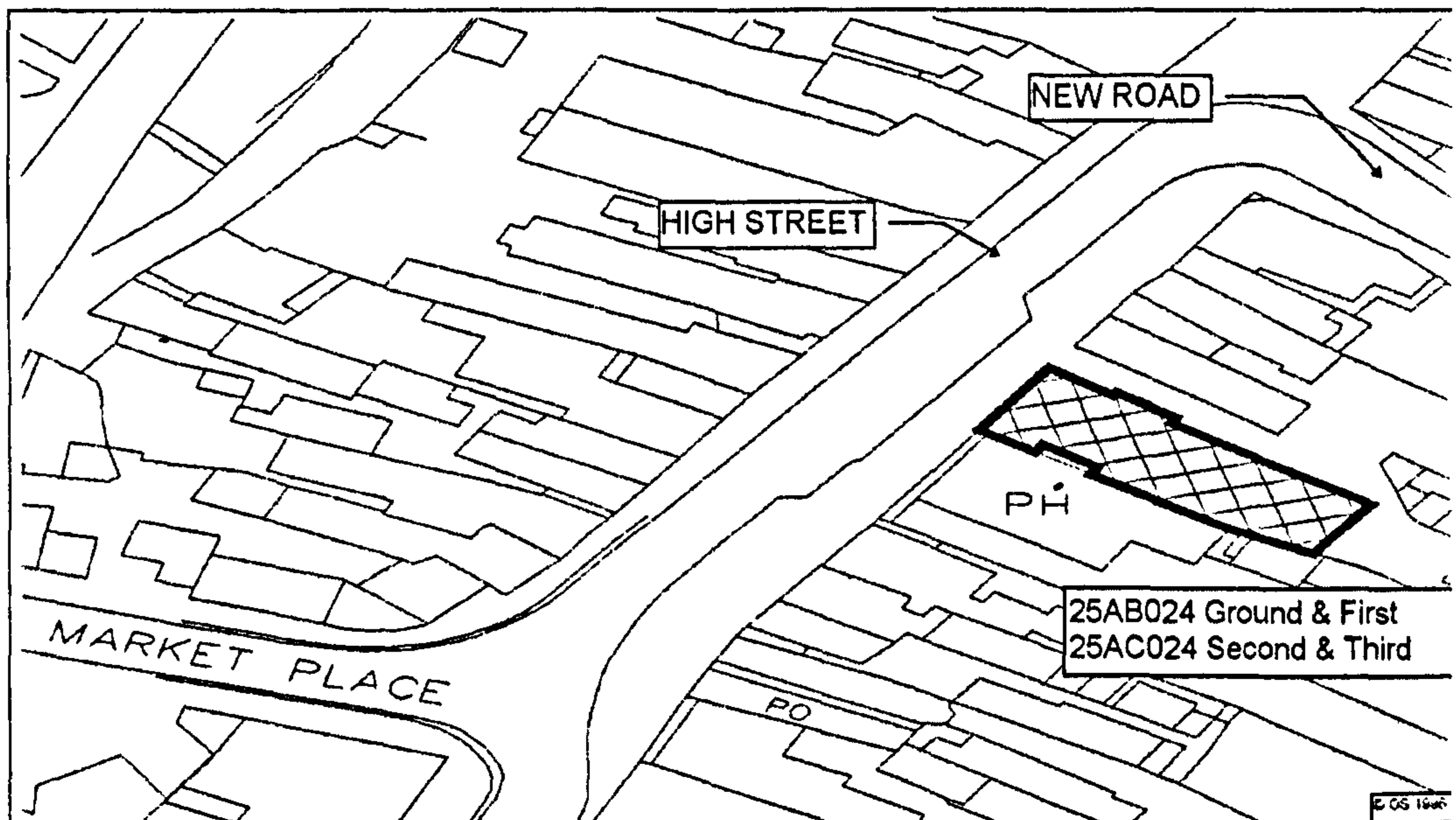
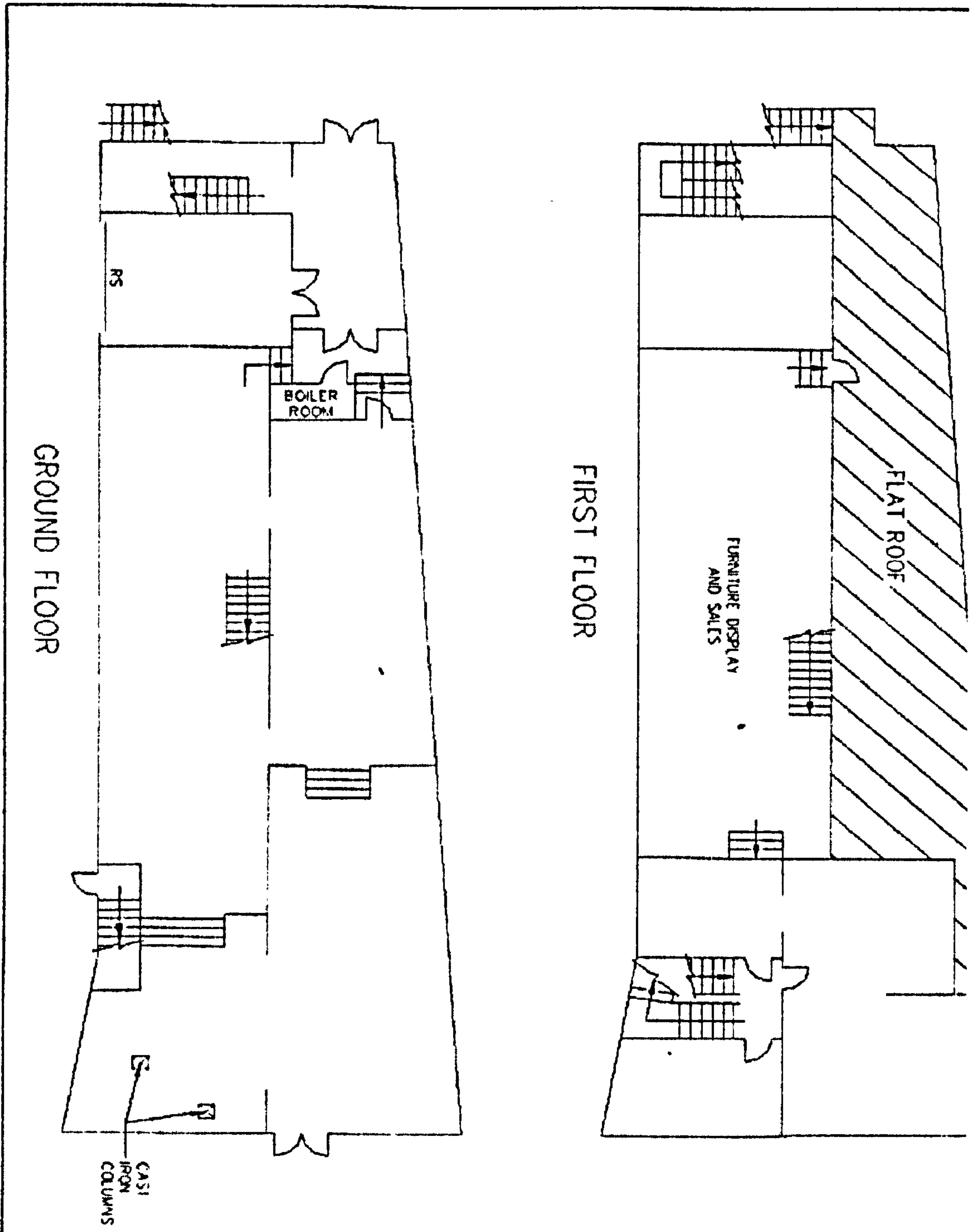


Plate 3: VMDS Tactical Information Plan/Risk Record, Hereford and Worcester Fire Brigade, October 1996.

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