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and the provision of UK fire services**

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**AT THE BLEEDIN' EDGE: MANAGING ON THE MOVE,
AMBIVALENCE AND THE PROVISION OF UK FIRE SERVICES**

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Abstract

Since the mid 1990s, fire services across the UK have begun to introduce mobile incident management information systems (known as Vehicle Mounted Data Systems or VMDS) with the intention of enhancing information to front-line firefighters and modernising the provision of fire services. Drawing on actor-network theory, this paper examines how fire service work is made increasingly mobile and how fire crews respond ambivalently to the implementation of a mobile information system. The paper argues that fire crews' ambivalence can be connected to a range of organisational uncertainties and practical ambiguities associated with the current and future deployment of the VMDS. This suggests that implementation of mobile devices is not a one-off initiative, but is characterised by ongoing iterations and an uncertain trajectory. From its deployment as a device to provide information 'anytime and anywhere' it is concluded that the VMDS has now become an important part of the future context for UK fire service provision.

Keywords:

mobile working

mobile information systems

public sector modernisation

UK fire services

actor-network theory

ethnographic research

Introduction

On 20 March 1853 *The Sunday Times* reported on a fire at the British 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). This quote from *A History of the British Fire Service* on Queen Victoria’s proficient use of the first electrical communication device presages contemporary preoccupations: 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.

Technological innovations have long been associated with transformative social and organisational change. Mobile devices such as smart phones, wireless laptops and PDAs are similarly associated with bringing about significant changes to where, how and when activities take place. This paper examines the implementation and use of a mobile infrastructure (the Vehicle Mounted Data System or VMDS) at Hereford and Worcester Fire Brigade. This mobile device was first of its kind in the UK fire service and is considered to have important best practice implications for the provision of mobile information to operational firefighters across the UK. Drawing upon insights from actor-network theory, the paper analyses how fire crews’ work is made mobile and how what counts as mobile is interconnected with particular organisational

practices for extending the temporal and spatial reach of information. This provides the basis for examining how crews' responses to the implementation of the VMDS is related to ongoing organisational uncertainties, notably attempts by at brigade level to sustain local autonomy, and to persistent practical problems associated with using the VMDS at operational incidents. From this it is concluded that the crews' ambivalence to the VMDS can be understood in terms of how it is a device that modernises the content of the brigade's information management practices, but is simultaneously a constitutive actor in the emerging context of ICT-enabled change across UK fire services. The paper concludes with an outline of implications for future research.

Contextualising UK Fire Service Provision

Until recently ICT-led change has not been a significant feature of the change agenda within the fire service (cf., Fire Service Mobile Data Task Group, 2002). A pervasive feature of UK fire service provision over the last 25 years has been the tensions between stabilities associated with national collective agreements and risk response standards relating and controversy-inducing government initiatives and reports, often initiated by central government (e.g., Audit Commission, 1995; Bain et al., 2002). Differences between the fire service and other parts of the public sector, particularly the public perception of a high quality and citizen oriented fire service that responds quickly to emergency calls plus intensive local trade union activism to sustain local authority funding even during periods of budgetary cuts, has meant that the timing, nature and process of change has taken particular forms with certain aspects of modernisation well established in other parts of the public sector being relatively absent from the fire service (see Fitzgerald and Stirling, 1999; see also Bain et al.,

2002). Fire cover standards and risk classifications are, for example, currently decided at a national level. National response times are also related to categories of fire cover and form part of the comparative performance reports that brigades must undertake and submit to central and local government.

Since the publication of the Audit Commission's (1995) report *In the Line of Fire* there has, however, been increasing pressure to introduce 'more efficient' and 'locally sensitive' front-line incident management practices. Notwithstanding this, according to the more recent *Independent Review of the Fire Service* (Bain et al., 2002), fire services remain characterised by a 'weak managerialism' that requires 'urgent modernisation' and stronger brigade leadership. In contrast to other policy statements and reviews of the public sector, such as the White Paper on 'Modernising Government' (Cabinet Office, 1999), the role of ICT-led change in fire service in national reviews has, until very recently, been hardly remarked upon. The technologically afforded mobility and 'joined up' service delivery that is associated with ICTs in other parts of the public sector is absent from national policy reviews during the 1990s. Compared to other emergency services, then, there has been an under-investment in front-line ICTs across UK fire services throughout the 1990s. Recent investment in the electronic provision of local authority services through centrally-led e-government initiatives is also minimal compared to other parts of the public sector, despite the emerging conjunction of electronic service delivery with modernisation (CACFOA, 2001).¹ This recent interest in electronic services has,

¹ In November 2001 the Chief and Assistant Chief Fire Officers Association submitted a bid for just over six million pounds to the Office of the Deputy Prime Minister for a National Fire Service e-Government Project (CACFOA, 2001). Modernisation is described in terms of better sharing of

however, occurred simultaneously with pressures on the fire service to make efficiency savings of over 100 hundred million pounds by 2007/08 with annual efficiency savings each subsequent year (Gershon, 2004: 49). Contextualised against these efficiency savings, and the estimated 20 billion Euros that the UK government will spend in 2005 on public sector projects of which nearly 5 billion Euros is for local government (Government Computing, 2005: 44), the small scale national e-fire project is reinforces the sense of a lack of investment in the fire service and the tensions of the modernisation agenda (see also ODPM, 2002).

Hereford and Worcester Fire Brigade

Hereford and Worcester Fire Brigade is one of 50 fire authorities in England and Wales. The brigade is responsible for an area of over 390,000 hectares and a population of over 700,000. It has over 700 wholtime/full-time and retained/part-time staff and over 100 non-uniformed support staff. Firefighters are allocated to a particular station 'watch' or 'crew'. The brigade follows the national practice of separating wholtime/full-time and retained/voluntary and part-time firefighters into distinct crews. This structure is recognised throughout the fire service as providing for strong bonds of commitment and solidarity amongst wholtime crews (see Salaman, 1986). By contrast, Bain et al., (2002) argues that, despite its historical benefits, this watch culture is now inflexible, macho and adverse to change and watches are a significant barrier to modernisation. Fire Service modernisation is, then, largely

information between brigades and collaboration with other public sector agencies (e.g., police and probation service), improving service to customers and encouraging citizens to be responsible for domestic fire safety through better access to information.

focused upon the shortcomings of what national reviews state is an outdated form of social organisation and lack of fire service leadership.

The brigade is comprised of 27 stations and each station has a designated 'turn out' area. This demarcates the geographical boundary of station responsibility and watch mobility. These boundaries are determined by a combination of national fire cover categories and local legacies. Fire crews are mobilised by the brigade's command and control centre based on turn out boundaries and the national risk classification. Fire crews' mobility is circumscribed in space and time by these turn out boundaries, the demands of major incidents or concurrent incidents.

Studying Mobility and the Vehicle Mounted Data System

Mobile devices are currently associated with distance defying, enhancing speed of communication and the range of information that can be made mobile. There is a growing body of research that focuses upon mobility including studies of working on the move and mobile devices (Brown et al., 2001; Hamill and Lasen, 2005) and mobility and society (Urry, 2000). Studies of mobile work within emergency services sector include Landgren's (2005) research on Swedish firefighters, Nulden's (2005) study of mobile devices for the Swedish police service and Sørensen and Pica's (2005) research on mobile work in the UK police service.

The research reported here is an Economic and Social Research Council (ESRC R00429534042) funded study with longitudinal ethnographic research undertaken from the late 1990s onwards with secondary data collected to date. Interviews and

observations were conducted at six stations, with twenty-four semi-structured and taped interviews conducted with deputy chief fire officer, divisional officers, assistant divisional officers, station officers, sub-officers, watch commanders, leading firefighters and firefighters. More informal interviews, which were usually not recorded, were conducted with nine wholetime day and night fire crews as well as with individual firefighters. Stations were also revisited a number of times to conduct follow up interviews or undertake observations. Archival research was conducted at the brigade and at the UK National Fire Service College library.

Fire crews' operational mobility is comprised of distinctive characteristics that are embedded in the multilateral organisation of fire services. The early history of fire crews carrying rudimentary information in fire appliances dates back to the late 1940s. From the late 1980s some types of risk information has been communicated via in-cabin printers connected to the command and control centre (Fire Service Mobile Data Task Group, 2002: 4). For a number of decades, then, information has been carried by fire crews yet neither risk records nor transmitted status updates have been associated with "mobile data" per se'. This is in part because firefighters' specific character of mobility is delimited to station and county boundaries but also because of the discursive ideal of technologically afforded mobility was not operationalised within the fire service.

In 1993 two of Hereford and Worcester Fire Brigade's firefighters died at a major fire incident at the Sun Valley poultry factory in Herefordshire. This major incident was attended by fire crews from across the brigade. In May 1994 a Health and Safety

Improvement Notice stated that the brigade was in contravention of the Health and Safety Work Act (1992) because

the information held by the Brigade and available to fire crews and officers on particular hazards ... is insufficient to ensure ... the health and safety of firefighters (*The Grapevine*, Summer, 1997: 8).

The brigade installed the VMDS on 36 fire appliances in March 1996 in response to this lack of information at the 'right place at the right time'. The VMDS is a response from a national instruction to improve working practices. VMDS screens and keyboards are mounted on the dashboard of the fire appliance and linked to an in-cabin printer. The device is a fire appliance-based, mobile incident information management system. It provides standardised and real-time on-screen information to firefighters on the move and at incidents. It provides, says Goodwin (1997: 39), 'data on mobilisation ... data en route to an incident ... data at the scene'.

The technical requirements of the VMDS includes: 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. Other requirements include the use of commercially available software and low-cost administrative support (O'Dwyer, 1996: 33-34; see also Sherrington, 1995). After implementing the VMDS Goodwin (1997: 39) claimed that: 'A senior Home Office official has described it as the greatest advance in 20 years'.

Use of the VMDS is described in internal brigade communications as bringing together previously dispersed spatial and asymmetrical temporal activities: with the VMDS, firefighters no longer need to spend their time locating information that is spatially dispersed on paper or communicated via radio and is temporally dislocated. The VMDS provides risk information on buildings (also known as the Central Risk Register), often supplemented by building plans using CAD/CAM software; first response Tactical Information Plans (TIP); 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 the brigade's Operational Intelligence Unit. This unit was formed in conjunction with the implementation of the VMDS, and is responsible for maintaining risk records from crews' fire safety inspections. Tactical Information Plans, for example, comprise of 'must have' information: '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).

Making Information Mobile, Identity and Ambivalence

Early actor-network studies focused upon the 'heterogeneous network building' (Law, 1992) of scientists, engineers and colonisers who work across scientific, technical, political and professional domains to stabilise networks of associations and constitute

know how that can move across space and time. Latour (1988), for instance, describes Pasteur as a scientist-entrepreneur whose efforts to translate bacteria, farmers, the scientific press and agricultural societies culminate in practical techniques that are an extension of his laboratory in Paris to all French farms. Farmers who carefully follow Pasteur's instructions and practices for disinfection and inoculation can ensure their cattle no longer die from anthrax microbes because they can reproduce the Pasteur's laboratory on the farm. Thus in order to understand how a scientific fact or technological innovations becomes universally adopted, how they become mobile, it is important to follow actors and understand how they enrol others into networks of associations. Global mobility denotes the ability to augment the scale of a local network across spaces and times.

The actor-network approach (see Callon, 1986; Latour, 1988, 1996; Law, 1987) has also been applied to analysing information infrastructures (see, for example, Avgerou et al., 2004; Latour, 1996). In addition to the 'heterogeneous network building' associated with actor-network theory, two further features of the approach are relevant to preoccupations with mobile devices and mobile work. The first is that mobile devices are conventionally associated with moving work around organisations, to different locations, shifting the temporal dimension of work and redistributing divisions of labour in unprecedented ways (see Rheingold, 2003). By contrast, Pollock and Cornford (2002) argue that the mere presence of mobile devices does not make work mobile. It is, rather, the decoupling from local constraints that affords mobility and that this is the basis for 'placeless' forms of organisation that can occur 'anytime and anywhere'. Seen in this way, understanding mobile information systems means focusing upon the work that goes into making organisational activities mobile

through information systems rather than assuming a priori that mobility is an outcome of particular technological innovations.

Pollock and Cornford (2002) argue that making information mobile is connected to the desire to transcend the local perspective and provide 'a view from nowhere'. This denotes an emphasis upon how activities are turned into 'information' that can be accessed outside of their local context and disconnected from a particular place.

Porter (1994: 217-30) connects information, place and objectivity and argues that:

The creation and use of information needs to be understood first of all as a problem of space and scale, of getting beyond what is local, personal or intimate and creating knowledge that is, so far as possible, neutral and well standardised. The ideal, in short, to go beyond perspective, to turn a view somewhere into 'a view from nowhere'. Businesses and governments, as organisations spreading over large territories, depend on this.

The second feature of actor-network theory that is relevant to studying users of mobile devices relates to the identity and activities of users 'on the move'. Classic network studies (e.g., Callon 1986; Latour, 1988) contend that maintaining workability comes about from actors at the periphery (farmers for Pasteur, for instance, but for our purposes users of mobile devices) being disciplined into becoming largely rule following actors whose identities and interests are aligned to some kind of network 'centre' such as Pasteur's Parisian laboratory. There are, however, significant limitations to this focus on top-down enrolment of interests and identity and the implication that network stability comes from the alignment of

interests. Firstly, it neglects how maintaining the workability of scientific innovations or technological devices often entails a range of situated adaptations, ‘work-arounds’ or improvisational acts that ‘holds the network together’ (see Ciborra, 1999). For Ciborra, situated negotiations, proficiencies and skills ‘in the field’ have to occur to sustain the network of associations. Secondly, it fails to account for the particular interests of actors at the ‘periphery’, how these might be different from other actors, and how these interests might transform the network into something different (see de Laet and Mol, 2000).

The emphasis upon ‘decentralised activities’ also foregrounds issues relating to identity and ambivalence. A focus upon ambivalence provides a way of uncovering the multiplicity of responses to mobile devices. This also challenges the notion of integrated, ‘clean and clear’ networks characteristic of early actor-network approach. Singleton and Michael’s (1993) study of doctors’ discourses around the UK Cervical Screening Programme documents how doctors are both ‘ardent stalwarts and outspoken critics’ of the screening practices: they are ambivalent about the programme. Doctors are simultaneously enrolled as ‘unitary’ ambassadors of medical science by the programme, but doctors also enrol other actors in order to enhance their autonomy and expertise within the programme and as such construct ‘networks in their own right’.

Singleton and Michael’s emphasis upon ambivalence and the network building by doctors foreground how GPs translate other actors in order to redefine and consolidate their own identity commitments. Doctors can do this because the content and direction of the programme is uncertain. McLoughlin et al., (2005: 68) are similarly

interested in broadening the scope of ambivalence to incorporate uncertainties, contradictions and ambiguities associated with the ongoing deployment of initiatives. Drawing upon a longitudinal study of large-scale normative change they suggest that ambivalence is often associated with various interpretations of ‘known phenomena’ and add that though there is increasing recognition of ambivalence

such analyses still tend to ‘totalise’ intentionality, rhetoric and sometimes structural effects of such programmes. That is, what employees and some managers are ambivalent *about* is assumed to be relatively clear and unproblematic (emphasis in original).

McLoughlin et al., contend that initiatives are often characterised by ‘substantial and persistent’ uncertainties and ambiguities rather than ambivalent interpretations of unitary and unproblematic plans or devices. They suggest that this challenges the dichotomy between top-down planning and decentralised emergence. For our purposes this means that to the extent that mobile devices are characterised by ambiguous and uncertain trajectories they are shaped in an ongoing fashion as they undergo various iterations. Understood in this way, studying users of mobile devices requires a form of analysis of identity that goes beyond deterministic and overly simplistic accounts of centralised enrolment and focuses upon situated identity commitments. It also presages how these commitments can bend and twist the trajectory of mobile devices because their deployment over time and place is uncertain and unclear.

Challenging the dichotomy between top-down planning and emergence is valuable, but McLoughlin et al., reintroduce an ontological divide around the contradictions of ‘structural context’ and ‘content of initiatives’. Actor-network theory’s emphasis upon ‘network building’, by contrast, requires what Collins (2004) discerns is a more radical ‘de-separated’ or ‘symmetrical’ form of analysis. *Contra* ‘externalist’ accounts (e.g., Grint, 1994), which examine the content of practices and how these interact, or fail to connect, with a wider context, an actor-network approach focus upon how actors ceaselessly traverse the dichotomy of content and context, reconstituting what counts as content and context (see also Cooper, 1992). Hence, not only will devices such as information infrastructures vary with a particular context but, symmetrically, such infrastructures have a profound effect on the context to the extent that they often become part of taken for granted practices and speak of and for a context/collective and ‘act to make future worlds and technological developments real’ (Collins, 2004: 679). For the study of mobile devices and mobility, this denotes a symmetrical analysis of how the context or ideal of mobility is constructed through devices such as the VMDS—how the VMDS becomes increasingly potent actor which represents and frames the future of the fire service in particular ways. Further, ambivalence is constitutively linked to the trajectory of associations that construct the content and context of the VMDS over time and space.

Universal Access to Mobile Information

The implementation of the VMDS provides each fire crew with real-time access to the same information from any fire appliance. This was often described in terms of ‘universal access’. 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 part of a significant 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, 1988) and with this the deployment of new resources. The acceptance of the VMDS and Operational Intelligence Unit by fire crews working at the 'periphery' has therefore to be explained as the firefighters' union was well known for contesting managerially driven initiatives. This means examining how the VMDS is contextualised and decontextualised in particular ways. The Chief Fire Officer described the attitude to the VMDS at the brigade in the following 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 ... 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, there were few voices of dissent from the view that the VMDS was an incredibly useful operational tool at incidents. There are, however, additional ways in which the VMDS is contextualised and decontextualised and these relate to the boundaries of mobile information at the brigade.

The VMDS is associated with the provision of mobile information that is universally available to all fire crews. In addition to substantial work entailed in making information mobile, the VMDS is accessible only by fire crews within the brigade: VMDS standardisation is, then, not only a technical matter, but it also presupposes particular organisational practices which are translated into a technical design (see Monteiro and Hanseth, 1996). Standardisation via the VMDS is mutually compatible with established county boundaries for incident responsibility, rather than regional ones, and this means that a range of actors within the brigade are aligned with the scope of mobile information afforded by the VMDS because it does not pose a significant challenge to long standing bases of county authority and brigade autonomy. In analytical terms, this denotes how what counts as mobility is not pre-given but is often evaluated in light of existing organisational practices. At Hereford and Worcester Fire Brigade it is a vision of infrastructure as closed and ordered by a top-down form of governance (see also Ciborra, 2000: 35).

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, but risk assessments are still carried out by fire crews. This matching of organisational structure and work routines with the VMDS meant that the device was subject to less controversy and was less visible, and as a consequence became part of the taken for granted infrastructure at the brigade relatively quickly.

The Operational Intelligence Unit provides a range of formalised procedures, checks and balances to fire crews' expert risk assessments that were then transferred to the VMDS. 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: Porter's 'view from nowhere'.

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 of a small, rural

brigade that would likely be subsumed by a larger neighbouring brigade in the context of a government-led agenda for modernisation that is unclear and uncertain in content and direction .

The VMDS thus marks out a means of catching up with other brigades particularly the neighbouring and rival 'high-tech' brigade, and denotes an attempt to integrate the brigade into the select group that are at the forefront of the deployment of mobile information systems. At the brigade these hopes centre upon attempts to preserve and enhance the brigade's ability to influence future decision making in relation to a potential regionalisation of fire services. To the extent that the VMDS and the Operational Intelligence Unit is cultivated as an institutionalised 'centre of calculation' (Latour, 1988), the brigade is in a better position to be a significant part in enacting the boundaries, timing and content/context of any future regionalisation.

Spatial and Temporal Disordering on the Move

The VMDS is the materialisation of assumptions that mobile devices provide ready to hand access and easy retrieval of disembodied information whilst on the move (for example, see Suchman, 1987). The brigade was often involved in demonstrating the VMDS to other fire services across the UK and these carefully choreographed presentations reinforced the notion of disembodied information. Demonstrations always lacked detail on the situated use of the VMDS and how practices that make devices workable are often invisible or marginalised. The situated and collective character of fire crews' work was made visible through informal demonstrations undertaken as part of observation of firefighters' work.

Usage of the VMDS reconstructed fire crews' situated activities around a number of spatial and temporal problems that crews complained they could do little about.

Before the VMDS was implemented 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. The VMDS made this collective structure of interaction between firefighters much more difficult.

Bolted to the dashboard 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 Officer in Charge and the VMDS.

The second practical problem 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' on the way to an incident. This meant that the temporal pressures on the officer intensified because of the compression of interaction within fire appliances around the VMDS. Officers described the not insignificant difficulty of putting on fire clothing, boots, accessing the VMDS, helping the driver to navigate, watching out for other vehicles, deciding upon an initial 'incident plan' and attending to radio communication to the 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 of retrieving information 'ready to hand' 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 within crews. For many

crews the spatial and temporal effects meant that VMDS would not be accessed until the fire appliance reached the incident and was stationary.

These demonstrations problematise the spatial reach and real-time temporality with which the VMDS is associated. Front-line fire crew usage of the VMDS foregrounds how the ‘joined up’ access to information on the move also creates spaces and times of disconnection. Such activities also illustrate the ongoing ambiguities of technological infrastructures such as the VMDS in the face of acceptance of the device by fire crews. For Ciborra (1996: 30), acceptance of a technological device is connected to issues of hosting and, more generally, hospitality and ‘acceptance has to face ambiguity: coping, thus, becomes hospitality. In its turn, hospitality is an unstable way of coping with a stranger: it can suddenly turn to hostility’. Haddon (2004) terms this dialectic of hospitality and hostility as ‘domestication’ to evoke a sense of ‘taming something wild’—something that may offer an improved future or be threatening. It is the duality between hospitality/hostility that presages issues of ambivalence to which we now turn.

Risk Records, Ambivalence and Fire Crew Identity

The task of transferring paper risk records (known as paper 1.(1).D records) to the VMDS, and ongoing management of information, was 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 the 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 replaced with absent records. The initial rationale for implementing the VMDS was to rectify the information and communication failures at a major incident, and fire crews remembered this incident and the broad appeal associated with the VMDS. The small number of records was not, however, related to a technical limitation (lack of computer memory) but associated with an organisational problem of recruiting a CAD/CAM specialist and a lack of human resources at the Operational Intelligence Unit.

Although stations were told to throw out their paper 1.(1).D records and paper OS maps a number of stations were reluctant to do this and had kept spare copies of records and maps. 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 consulted concealed paper records and accessed the VMDS screens. Fire crews, in

other words, attempted 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 the 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 functionality. Similarly fire crews support the VMDS with A4 paper folders containing 1.(1).D records and paper OS maps. This alignment of fire crews with the VMDS can be understood as 'internal network building' on the part of the crews, and this means that instabilities associated with VMDS information are reworked by fire crews' use of non-VMDS artefacts.

Fire crews are simultaneously aligned in the VMDS and are enrollers of other actors: fire crews buy into the future capacities, particularly the long term benefits of the VMDS, and 'strategically problematise' the current usage of the VMDS. For Michael and Singleton (1993) the instabilities associated with the VMDS would constitute a resource, 'the indeterminacy necessary', for crews to construct their identity in relation to the uncertainties surrounding the functionality of the VMDS. This indeterminacy, and the consequent enrolment of other actors by fire crews, foreground two points. 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 a leading-edge mobile device. This demonstrates the ongoing role

of crews in the successful operationalisation of front-line innovations even though information management has been centralised to the Operational Intelligence Unit. It is through the enrolment of an array of materials in support of the VMDS that fire crews attempt to construct themselves as a 'centre of discretion' (see Munro, 1999) and through which they can shape the future trajectory of practices for managing operational incidents. Second, within the particular structural location and delimited authority of fire crews, backing-up the VMDS with paper records is what the fire crews can do to maintain the workability of this leading-edge mobile device.

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. As part of the local enrolment by fire crews, the VMDS is, for example, associated with the deployment of Tactical Information Plans that emphasise risks to firefighters rather than the risk category of a building. This is considered a significant step toward a safer working environment for fire crews. The future role of Tactical Information Plans in reorienting notions of risk around firefighters rather than buildings is, however, ambiguous and uncertain. Nonetheless, the uncertainty surrounding the TIPs, in conjunction with the promise of improved VMDS risk record management in the future, provides the conditions for crew' enrolling other actors in order to sustain the workability of the VMDS.

The paper risk records which fire crews used to back-up the VMDS were also 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. 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 future centred around innovations in mobile information systems—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 ... 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 ... [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 to another paper system. It demonstrates that the changes in the use of risk records at the brigade are more than a one-off event. VMDS risk records, introduced in the late 1990s, came

out of paper risk records, and these risk records were themselves based upon other risk cards, each of which were instantiations of previous practices going back to the mid-1970s. In this sense the implementation of the VMDS does not suddenly constitute an entirely new turn to ‘information management on the move’. The reduction in the number of risk records has, instead, a precedent a number of years before the VMDS. Contextualised against previous governmental-inspired rationalisations, the VMDS is associated with an increase in the totality and type of information available to fire crews within the brigade.

Concluding Remarks

The VMDS at Hereford and Worcester Fire Brigade was implemented to rectify the problem of a lack of information at the right place at the right time. It is a device that constitutes information as mobile at the level of the brigade: integral to the mobility of information associated with the VMDS is a reaffirmation of the importance of brigade-level authority, national agreements on working practices and the existing structure of watch organisation. The research implication from this is that studying mobility means attending to what counts as mobility in a particular context and how the context is constructed out of mobile devices such as the VMDS. Mobility is, then, the relational outcome of technical, organisational, historical, cultural and professional relations rather than a pre-given effect of mobile devices.

The VMDS is aligned with the promise of a broad technocratic response to the vagaries of government and managerial inspired modernisation. National reviews of the fire service have, until recently, been centred upon organisational and human

resource changes rather than ICT-led change. The VMDS was therefore relatively unproblematically adopted into the brigade because it is allied with front-line information provision—‘hi-tech kit’ for frontline fire crews—and distinct from external initiatives. From this it can be concluded that mobile devices in UK fire services, like technological infrastructures more generally, are often appraised against existing preoccupations and information management practices. The VMDS appealed to the 1990s ideal of access to information ‘anytime and anywhere’, but the deployment of the VMDS illustrates how a brigade can react to the demands placed it by external actors such as the Health and Safety Executive: the brigade translated their existing practices, boundaries and assumptions into a technological infrastructure. This research suggests, then, that in the early deployment of the VMDS, Hereford and Worcester Fire Brigade absorbed and incorporated formal demands from outside the brigade.

Persistent and substantial practical problems associated with use of the VMDS presage the ambiguities and uncertainties of current and future deployment. Problems with access to information on the move were ameliorated because fire crews are enrolled in the collective up-keep of the VMDS. Fire crews’ ambivalent response to the problematic functionality of the VMDS suggest that it is an ‘unfinished’ device rather than simply a set of screens from which information can be retrieved on the move. On 17 October 2002 the Budget Working Party set out the initial cost for the ‘second generation’ VMDS at the brigade, allocating a budget for 2003/04 of £250,000 (Hereford and Worcester Fire Brigade, 2002: 13). Upgrading the VMDS demonstrates how the content of mobile data devices is an ongoing rather than one-off initiative. This research has also demonstrated how the deployment of mobile data

devices is also connected to organisational uncertainties, forms of spatial and temporal ordering and disordering associated with mobile devices, and commitments to particular workplace identities. In an empirical and, critically, analytical sense the VMDS can be characterised by continual and ongoing deployment in a way that challenges the distinction between top-down implementation and emergent configuration.

In addition to the continual development of the VMDS at the brigade, from the late 1990s onwards, a significant number of brigades across England, Wales and Scotland have implemented VMDS mobile devices. This includes brigades in Cumbria, Devon, East Sussex, Lancashire, Norfolk, Nottinghamshire, Northamptonshire, South Wales, Strathclyde and Surrey, to name a few. The VMDS is now an important actor in the future context of UK fire service provision so much so that VMDS-based information sharing formed one of the five primary objectives of the national e-fire project, which began in 2002 with the aim of providing a national portal and database for UK fire services. The discursive vision of information sharing was, then, translated from brigade-based practices to 'joined up' inter-brigade and inter-agency collaboration, particularly at the regional level.

The imperative or fate of technology, however, is, according to Latour's aphorism, always in the hands of a future community. In January 2005, the ODPM announced that the information sharing stream of e-fire would be dropped due to its complexity and the ODPM timetable for e-government initiatives (LFEPA, 2005). Despite the fragile status of mobile data systems, it can be concluded that, in addition to fire crews, national policy forums, senior officers' associations, firefighter unions, central

and local government, the 'community' of the UK fire service is now made up of an actor known as the Vehicle Mounted Data System. Although the practices of electronic information sharing across brigade boundaries remains underdeveloped in the UK fire service, over the last decade mobile data systems have come to provide an institutionalised and increasingly important context for the future trajectory of UK fire service provision.

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