THE COLLAPSE OF TECHNOLOGIES IN EMERGENCY RESPONSE

IS ANYONE THERE? THE COLLAPSE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE SOCIAL WORLDS OF POLICE, FIRE AND EMERGENCY MEDICAL SERVICES

By

CARRIE B. SANDERS, M.A., B.A.

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AUTHOR: Carrie B. Sanders, B.A. (U of Waterloo), M.A. (Carleton)

SUPERVISOR: Professor Carl Cuneo

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Abstract

Emergency preparedness has become a significant concern in the wake of such horrific events as school shootings, terrorist attacks and natural disasters. The political attention given to emergency preparedness is largely connected to its apparent failure during the terrorist attacks on the World Trade Centre in 2001. Since these attacks, there has been substantial attention given to the state of emergency communication and information sharing (i.e., emergency interoperability). To improve emergency interoperability, information and communication technologies (ICTs) have been implemented throughout Emergency and Protective Services in Canada and the United States.

Using contextual constructionism, social worlds / arenas theory and concepts from science and technology studies, I assess how these technologies are used by emergency responders in two organizationally distinct Canadian Emergency and Protective Services. From this comparative situational analysis, I uncover a two-part critical design-use disconnect between: (1) how emergency ICTs are designed to function and their in-situ application (*functional disconnect*); and, (2) how emergency technologies are conceived and defined to be needed by different emergency responders and ICTs designers (*ideological disconnect*).

The functional and ideological disconnects, I argue, have resulted from: (a) technological anomalies arising from the incorporation of nonhuman actants (such as outside technologies and geographical landscape) and human heterogeneity (numerous workers belonging to various social worlds with multiple needs and uses); and, (b) the various social worlds' ideological and organizational contexts that guide the implementation and use of emergency technologies. To date, emergency ICTs have been implemented with little analysis of their impact on frontline responders or society at large. The present research, therefore, provides a grounded analysis and identifies how the *local*, *situational* and *organizational* use of emergency technologies can create impediments to emergency interoperability and collective activity.

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It is in loving memory of my aunt, Cheryl Sanders Markle, that I dedicate this work. May a cure for cancer be found so no one else has to lose a friend, aunt, sister, mother or grandmother!

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List of Abbreviations

ANI/ ALI	Automatic Number Identifier / Automatic Location Identifier
ANT	Actor Network Theory
ARIS II	Ambulance Response Information System
CAD	Computer Aided Dispatch
EMS	Emergency Medical Services
EPS	Emergency and Protective Services
ICTs	Information Communication Technologies
IT	Information Technology
KM	Knowledge Management
LEIP	Law Enforcement Information Portal
MDT	Mobile Data Terminals
MSAG	Master Street Address Guide
PERS	Public Emergency Reporting System
RM	Risk Management
RMS	Report Management System

Chapter One: The Growing Concern over Communication and Information Sharing

Introduction: Emergency Response and Information Technology

Living in a 'knowledge-based economy' has led to increased dependence on, support for, and investment in the development and implementation of information technologies. There are very few segments of our everyday lives that do not incorporate or rely upon the use of information technologies. For example, advanced technologies are implemented and thriving within such segments of society as: health, education, transportation and emergency preparedness, to name but a few. These technologies are constructed, and I would argue perceived, to provide a secure, knowledge rich and sustainable future. Indeed, information communication technologies (ICTs), such as portable radio systems, Computer Aided Dispatch (CAD) Systems, Records Management Systems (RMS) and Mobile Data Terminals (MDTs) have fundamentally changed workplace practices and procedures. Much of the advancement and implementation of information communication technologies (ICTs) has been the result of our growing need to maintain *accountability* within the workplace through the acquisition and dissemination of *innovative*, *objective* and *authentic* forms of information and knowledge.

Information communication technologies (ICTs) are perceived to be absent of social bias, with their use leading to accountable, informed and objective forms of decision-making. There are few organizations with a greater demand or need for information management strategies and objective decision-making procedures than

emergency response. To reduce concerns over socially sorting people within emergency classifications and response, Emergency and Protective Services (EPS) have incorporated ICTs to centralize and standardize work processes (Ericson & Haggerty, 1997; Ericson & Shearing, 1986).

Emergency response Computer Aided Dispatch (CAD) Systems, Records Management Systems (RMS) and Mobile Data Terminals (MDTs) act as objective, 'standardized' classification systems that remove social impacts, such as socio-economic status, race, gender and occupation, from emergency classifications and response (Ericson & Shearing, 1986, Sanders, 2006). Emergency technologies not only provide police officers with standardized procedures, but they also offer tight integration and interoperability among the various agencies of emergency response, such as 9-1-1, police, fire and Emergency Medical Services (EMS)[1].

Using contextual constructionism, social worlds / arenas theory and concepts from science, technology and society, I assess the impact that advanced emergency ICTs, specifically portable radio systems, Computer Aided Dispatch (CAD) Systems, Records Management Systems (RMS) and Mobile Data Terminals (MDTs), have on the labour and work processes of emergency responders. Although numerous studies have been completed on ICTs and their impact on work productivity, few have provided insight into how workers go about using and adapting emergency ICTs within their specific situational and organizational work contexts (for a detailed discussion of this deficit in the literature see Bansler & Havn, 2006; Sorensen & Pica, 2005). To study emergency

[1] Webster's dictionary defines interoperability as the capability to operate compatibly individually or together ("The New Lexicon Webster's Encyclopedic Dictionary of the English Language", 1988)

responders' interactions with ICTs, I conducted a situational analysis of two organizationally distinct Canadian Emergency and Protective Services (EPS). To maintain the anonymity and confidentiality of the officials and workers who generously cooperated in the research, the names of the two Canadian case-studies have been changed to *Rural* and *Urban* EPS.

From this comparative situational analysis, I argue that there is a *functional* and *ideological disconnect* between ICTs designers' construction of the need for and the intended use and function of emergency ICTs, and the technologies' in-situ application by emergency responders. For present purposes, '*functional disconnect*' refers to a critical break between how a piece of technology and its applications were designed to operate and function, and their interpreted *in-situ* use and application (see Chapter Six). '*Ideological disconnect',* on the other hand, refers to a critical break between the designers' conception, definition and beliefs surrounding the need for and intended use of a piece of technology, and the beliefs, understandings and definitions of the need for and use of these technologies by emergency responders (see Chapter Seven).

Both the functional and ideological disconnects are unique and distinct conditions that help illustrate a critical break between how a piece of technology has been designed to operate, and how it is used 'on the ground'. Although at times the functional and ideological disconnect can be reciprocal, with one leading to the other (for example, an ideological disconnect can lead one person, who conceives of and defines a piece of technology differently, to use the technology in a manner that is different to and opposite

from its original designed purpose / function), they can, at other times, have little to do with each other.

The present study, therefore, uncovers a two-part *critical design-use disconnect* within: (1) how emergency ICTs are designed to function and their in-situ application (i.e., functional disconnect); and, (2) how emergency technologies are *conceived* and *defined* to be needed for emergency response work (i.e., ideological disconnect). This disconnect, I argue, results from: (a) technological anomalies arising from the interplay of nonhuman actants (such as outside technologies and geographical landscape) and human heterogeneity (numerous workers belonging to various social worlds with multiple needs and uses); and, (b) the contextual, situational and social world settings in which the technology is utilized.

Claims-Makers and the Typification of Inadequate Emergency Information and Communication Sharing

Although within policing attention has been given to the connections between social categories (such as race, age, socio-economic status, etc.,) and emergency classifications and criminal charges (CBC, 2006a, 2006b, 2006c, 2006d), there are growing concerns with the overall state and working infrastructure of Emergency and Protective Services in general (EPS). EPS have been prevalent and thriving since the beginning of centralized emergency dispatching, such as 9-1-1 in Canada and the United States (see Chapter Three for further details on the history of 9-1-1 in Canada). The origin of EPS was to provide an institutional infrastructure for emergency workers to create and put in place 'localized' emergency action plans, and to disseminate emergency

awareness to its city dwellers on how to prepare for, and act within, an emergency situation.

Although EPS have been around for decades, their relevance has become even more apparent in the wake of such horrific events as school shootings (Columbine, Virginia Tech, École Polytechnique, and Dawson College), terrorist attacks, and natural disasters (such as tsunamis, earthquakes and ice storms). Following these incidents, there has been increased government, public and media attention given to the state of the nation's emergency preparedness plans. The political attention given to emergency preparedness is largely connected to its apparent failure during the terrorist attacks on the World Trade Centre in 2001. Since these attacks, there has been substantial public, academic and political attention given to the state of emergency communication and information sharing within emergency response and preparedness (Gandy, 2006; Lyon, 2001, 2003a)

Although emergency information and communication sharing has been of concern within EPS, the terrorist attacks on the World Trade Centre in 2001 galvanized public, academic and political attention to technological and communication interoperability within emergency preparedness (Gandy, 2006; Lyon, 2001, 2003a). For the purpose of this study, emergency '*interoperability*' refers to the socio-technical ability of emergency responders to immediately communicate and share information within and across their respective Emergency and Protective Services (i.e, 9-1-1, police, fire and Emergency Medical Services (EMS)).

During the terrorist attacks on the World Trade Centre, hundreds of frontline emergency responders lost their lives in the line of duty. Media and public reports surfacing after the terrorist attacks framed the numerous deaths as resulting from '*inadequate emergency communication interoperability*'. The following report, published in the Ottawa Citizen, reflects similar reports in both the Canadian and American press.

> A recent investigation by the New York Times revealed that police didn't tell the fire department the second tower was about to fall. Furthermore, the police radio network was not linked to the fire's system. Throughout the crisis, police and fire did not communicate – and that costs lives (Doyle, 2002: D7).

Since the terrorist attacks in New York City, concerns regarding emergency communication challenges and decentralized operations have been recognized in many countries. For instance, the article cited above went on to argue:

> Switch to Ottawa, where Dr. Robert Cushman, the city's medical officer of health, says there are lessons to be learned from the New York situation…..in Ottawa, many would argue, the emergency response system is even more confused ….The first thing that fails in an emergency situation is communications,…The trade centre disaster made that clear. That is horrific what happened in New York…To add system flaws to a tenuous communications equation…is to invite trouble (Doyle, 2002: D7).

Although Ottawa has not experienced a direct terrorist attack, the city uses the experiences of other countries to question its own emergency preparedness. The emergency communication disruption encountered during the terrorist attacks has since been socially constructed as a problem of 'inadequate communication and information interoperability' within emergency response (Best, 1995; Loseke, 2003).

Social constructionism, as a theoretical perspective, recognizes that social problems do not arise through *concrete*, *objective* conditions, such as inadequate emergency information and communication interoperability, but become known through the work of social actors who *define* those conditions as *problematic* (Spector & Kitsuse, 1987). Social problems, therefore, are viewed as socially constructed through the interpretive and defining work of claims-makers, such as the media, who structure problems by naming them.

For example, the claim of inadequate emergency communication and information interoperability was quickly disseminated to the public by various claims-makers, including members of the news media, various emergency preparedness organizations, private information technology corporations, and government officials. Through these actions, news people and emergency preparedness organizations, among others, transformed the *putative* condition of '*inadequate emergency communication and information interoperability*' into an *objective* social problem of 'inadequate emergency interoperability'[2] (Loseke, 2003; Loseke & Best, 2003) . In other words, by naming and defining the cause of emergency responder deaths during the terrorist attacks, these claims-makers contributed to the typification of the social problem (Best, 2003b, 1995). Notably, typifications work to reduce the complexity and ambiguity inherent in the putative condition (Best, 1995; Loseke, 2003). Typifying a 'putative' condition makes the condition real and capable of being examined, manipulated and fixed.

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[2] Throughout the remainder of the dissertation I refer to the constructed social problem of inadequate emergency communication and information sharing as *'inadequate emergency interoperability'*.

The claims surrounding inadequate emergency interoperability have been further strengthened through the rhetorical appeals made by police personnel for increased information sharing. Police organizations have made claims that inadequate information sharing has led to fewer 'criminal' apprehensions. Within Canada, for instance, concerns over inadequate access to and dissemination of police records have been framed within a localized context. Specifically, Canadian police agencies have been framing the problem of inadequate information sharing using an infamous Canadian criminal, Paul Bernardo, who committed a series of rapes in Toronto, Ontario before murdering three young women in the Niagara Region Southwest of Toronto. As one of my Canadian police officer participants noted,

> The demand for [interoperable] technology was driven by Niagara Region and St. Catherine's and others who were involved in the Paul Bernardo case. Since each of these agencies had contact with Paul Bernardo, but did not know that each other were also searching for them, they asked for technology to make them interoperable with each other *(Interview #21, Rural Police Officer).*

Similarly, a private police information technology designer, discussing the need to improve emergency interoperability, observed,

> In southern Ontario, we have a couple of clients there, who were trying to find a way to share information as a result of the Campbell enquiry, which was at the Bernardo trial, and what happened at the Bernardo case was that they realized that '*Oh, my god, Toronto had all this information on Bernardo, Niagara was looking for him and the two never connected. The Scarborough rapist was in fact Paul Bernardo*'. There was an inquiry and a recommendation was made that police departments should share...*(Interview #29, ICTs Designer).*

Within a social constructionist perspective, police officers and other claims-makers would be seen using rhetorical frameworks surrounding public safety to further their claim that inadequate emergency interoperability is a social problem.

The Social Problem of 'Inadequate Emergency Interoperability'

In order for a social condition to be recognized as a serious social problem, it must be accepted as such by a broad audience. A social condition, therefore, only becomes a problem when people recognize, define and respond to it as a social problem. What is and is not accepted as a social problem depends on the characteristics of the larger social, political, and cultural environment in which the condition exists (Loseke, 2003). For claims-makers to be successful in typifying and naming a social problem, they must make their claim general and broad enough to reach the largest audience possible. "The most general audience….typically unite in its worry only around the most extreme events, such as the terrorist attacks or the Columbine High School Massacre" (Loseke & Best, 2003: 39).

The social condition of 'inadequate emergency interoperability' does just that, as it plays to the public's fears of torture and death. Further, the growing concern over inadequate emergency interoperability has led to the creation of research centres focused on 'emergency preparedness' and the creation of interoperability work groups, such as the Canadian Centre for Emergency Preparedness. Specialized research and development sites have not only increased in number in response to the social problem of inadequate emergency interoperability, but their establishment further reinforces the legitimacy of the social problem.

Once a social condition has been typified and accepted by others as a social problem, the next step is to acquire a particular solution (Best 1995). In the case of inadequate emergency interoperability, the desired solution that emerged has been the implementation of advanced Information Communication Technologies (ICTs). Over the last decade emergency response organizations across Canada and the United States have been taking active steps to centralize their services (i.e. police, fire and emergency medical services (EMS)) through the implementation of shared ICTs (Brodeur & Dupont, 2006; Manning, 2003a).

Private high-tech companies around the world are taking this opportunity to create 'new' and 'improved' technology that makes emergency information readily available to all emergency workers (Whitaker, 2006). For example, Versaterm, a privately owned Canadian emergency ICTs company, has made active efforts to increase information sharing and interoperability between police agencies nationwide. Versaterm has also been actively working to improve their police and fire ICTs by adding enhanced functions and capabilities aimed at improving information and communication sharing (Versaterm, 2006a). Over the last five years alone, this Canadian company has developed an information server that enables police agencies to publish summary information (on people, places, vehicles, events) on their regional server. This server is then accessible to other police agencies across Canada and the United States (Versaterm, 2006a). This technology, therefore, has been constructed to help increase and improve information sharing amongst regional, national and international police agencies.

Given the public's fear of future terrorist attacks and emergency communication disruptions, many of these advanced ICTs have been readily accepted and implemented with little reservation or analysis of their actual impact on frontline responders' work processes (Altheide, 2006). More importantly, little research has been conducted on the technologies' capability in addressing the social problem of inadequate emergency interoperability. Furthermore, these technologies have been readily accepted with little thought given to the social implications of their use for the general public (Lyon, 2001, 2003a). The present dissertation provides a critical and grounded analysis of emergency responders' interactions with these technologies to assess their impact on information and communication sharing.

Although there has been an increasing demand by the government for improved communication interoperability and information sharing between emergency services, there has been little research conducted on the impact of such technologies on emergency preparedness and response (National Research Council of Canada, 2000). Emergency and Protective Services (EPS) have engaged in 'mock disasters' that require the overlapping work processes of all relevant actors within emergency response, such as fire, emergency medical services (EMS) and police. From these 'mock disasters', summary reports on technological and organizational problems and difficulties have been produced, which identify areas of concern, and these have been submitted to the relevant organizations and municipality leaders. As I found within both case studies, however, these summary reports remain unused, and in a few years, the 'mock disaster' is again performed.

Past Research on Emergency Response

While little practical research has been completed, there have been even fewer academic examinations of emergency response. During extensive literature searches, I could not find a single study examining the overlapping work processes of police, fire and EMS during a multi-agency emergency response. This is surprising, given the growing concern over emergency preparedness. While emergency response, such as 9-1-1, police, fire and EMS, have been studied separately, few of these studies have empirically examined the impact that Information Communication Technologies (ICTs) have on emergency responders' work processes. It is only within policing that theoretical attention has been paid to the impact of ICTs on work practices.

Much research conducted on policing, however, has focused primarily on the activity of the workers and not on their interaction with their technology, or more specifically, not on the effect / impact that their technology has on emergency preparedness in general. For example, there has been a significant amount of sociological literature published on 9-1-1 and policing that pays specific attention to the interactional processes and emotional labour involved in defining emergencies (Manning, 1988; Whalen & Zimmerman, 1990). These analyses uncovered the information game that occurs between emergency workers and the emergency caller "in which each tries to analyze the information others give off in order to determine what is genuine, false, sincere, or cynical"(Garcia & Parmer, 1999b: 298). From this research, the vital roles of semiotics, communication, contingency and trust, within emergency response have been identified (Manning, 1988). What has been missing from these

studies is an *in-situ* analysis of the relationship among the situational and interactional aspects of police work, the organizational context of police work, and the socio-technical processes incorporated within policing.

Other research on emergency response has focused on the social construction of emergency classifications. Such analyses have uncovered how classifications are not precise but instead are constructed through both tangible and intangible components such as: location of the incident, caller's identity and previous criminal history, call-taker's tacit knowledge and memories (Gilsinan, 1989; Whalen & Zimmerman, 1990). Within many of these analyses, there was inadequate attention paid to the technology used throughout the emergency classification process. These technologies, I argue, are vital to the classification and prioritization process and require the same analytic attention that the interaction between emergency worker and caller receives.

While little research has focused specifically on information communication technologies' (ICTs) role within emergency classifications, there have been analyses on ICTs' impact on the labour of patrol and traffic police officers. Some researchers have argued that the growing use of ICTs has led to the scientification of police work (Ericson & Shearing, 1986). Other research has looked at the benefits / functions police ICTs provide to emergency response, such as: mobility technology (the capacity to allocate officers to areas and position them to respond); training technology (systematic means to modify people); transformative technology (extends human senses and presents technical evidence in scientific form); analytic technology (those designed to aggregate, model, and simulate police data to facilitate crime analysis, crime mapping, and activities in aid

of crime prevention); and, communicative technology (diffuse information to the public at large) (Manning, 1992a, 1992c; Manning, 2003b).

Many of these analyses, however, do not examine the "in-situ" use of emergency ICTs, thereby leaving the contextual (organizational) and interactional processes involved in their functioning unexamined (Meehan, 1998). While some of these researchers have argued that technology in policing has not been well described, their own analyses focus specifically on the organizational changes in response to ICTs, without examining the broader picture of the labour and social changes caused by their design, implementation and use (Ericson, 1982; Manning, 1992a, 1992c; Meehan, 1998; Sorensen & Pica, 2005).

Present Research and Its Theoretical and Practical Contributions

The present dissertation draws upon contextual constructionism, social worlds / arenas theory, and research in science and technology studies that stresses the constructed character of facts and artifacts to empirically examine how emergency ICTs are used by emergency responders. Connecting these theoretical stances uncovers how emergency work processes, and their associated technologies, are defined relative to their local and organizational context.

The present study is unlike any found within emergency response research as it provides an *in-situ* analysis of the interaction between 9-1-1, police, fire, EMS and their technologies. This study makes four original contributions. First, I demonstrate the socially constructed nature of emergency Computer Aided Dispatch (CAD) systems, Records Management Systems (RMS), Mobile Data Terminals (MDTs), and interoperable radio systems by identifying the varying meanings, perspectives and

functions emergency responders hold towards these technologies (see Chapter Six and Seven). Identifying the multiple perspectives and interpretations reveals a critical *functional* and *ideological* disconnect between how the technology was designed to function, and its actual implementation on the ground (see Chapter Six and Chapter Seven). Second, I provide a sociological analysis of the work processes of emergency responders within a broader multi-agency emergency response. From this analysis, I uncover the overlapping and intersecting work practices of emergency responders and the important place boundary objects, specifically emergency ICTs, hold for establishing and maintaining social order (see Chapter Seven)[3]. Third, I uncover the critical role *organizational context, situational processes* and *technological anomalies* play in the use and functioning of emergency technologies. Specifically, I identify how emergency ICTs are subject to *individual actions* and *organizational contexts* which can change their intended use and function (as defined by ICTs designers) (see Chapter Six). Fourth, and lastly, by studying emergency responders' everyday interactions, I uncover the *interpretive flexibility* surrounding the meaning and relevance of 'information' and 'knowledge' within emergency response.

In the pages that follow, I first outline how emergency ICTs designers define the need for and intended use and function of their technologies as a way to address the social problem of inadequate emergency interoperability. Following this discussion, I present an empirical analysis of emergency responders' perspectives, definitions and in-

[3] Boundary objects, as described by Star and Griesemer (1989), can be used by people to establish collaborative and collective action among multiple intersections of work processes across distinctly different social worlds (Star & Griesemer, 1989).

situ application of emergency ICTs. From this empirical analysis, I describe how a *functional* and *ideological* disconnect has resulted from: (1) technological anomalies arising from the interaction of outside nonhuman actants, such as geographical landscape, and human heterogeneity; and (2) the overlapping and intersecting organizational structures and situational actions of emergency call-takers, police officers, fire fighters and paramedics within a multi-agency incident. Now that the focus of this research on inadequate emergency interoperability has been outlined, I will provide a brief synopsis of the upcoming chapters.

Chapter Outline

Chapter Two: Theoretical Underpinnings

This chapter acts as a traditional theory chapter. In it I present the theoretical underpinnings of contextual constructionism and social worlds /arenas analysis as they relate to the present research setting and theoretical argument.

Chapter Three: A Reflexive Account of Participating within the Social Worlds of EPS

Unlike other chapters, Chapter Three acts as a reflexive account of the data collection and analysis process. It is filled with detailed descriptions and examples of the methods used, as well as reflections on doing qualitative field research. Throughout this chapter, I provide a detailed account of my processes of: gaining entry and acceptance into the research sites, collecting data, and conducting detailed coding, discourse and situational analysis. From this account, I illustrate the interconnectedness of ontology, epistemology, and methodology throughout the research process.

Chapter Four: Social Worlds of Rural and Urban EPS

This chapter provides critical background information and a detailed description of the *Rural* and *Urban* Emergency and Protective Services (EPS). This is strictly a descriptive chapter that outlines how the various social worlds, within both case studies, are technologically and socially structured. This chapter provides insight into the technology used to perform emergency response and construct communication and information interoperability throughout the social arena of EPS. The chapter also outlines the composition and work practices of the various social worlds, thereby providing background information on the similarities and differences between the technological and organizational structure of both case studies.

Chapter 5: Emergency Response Information and Communication Technology

Chapter Five explores the means by which emergency response ICTs are discursively framed by ICTs designers and ICTs personnel. Throughout this chapter, I argue that emergency information communication technologies (ICTs) are framed in two interrelated and overlapping ways: First as technologies of knowledge management; and second, as tools of risk management. I argue that these frameworks demonstrate how 'interoperability' and 'risks' with respect to crime control are actualized. This chapter provides a descriptive account of ICTs designers' constructions of the need for, function and use of front line emergency response ICTs. This is not, however, a critique of the effectiveness of these technologies within the workplace, but instead provides an empirical analysis of the rhetorical and discursive frames used by ICTs designers and ICTs personnel.

Since there are numerous pieces of ICTs used by various emergency workers, the chapter focuses specifically on ICTs used within both the *Rural* and *Urban* case studies by police, fire and EMS. I begin the chapter with a short description of the discursive frameworks of knowledge management and risk management. Following this discussion are descriptive accounts of the ICTs designers' constructed need for, as well as their intended use and function of: Computer Aided Dispatch (CAD) systems, Records Management Systems (RMS), Mobile Data Terminals (MDT), and portable radios. The chapter concludes by summarizing the similarities and differences between emergency ICTs within both case studies, as well as providing an analytical examination of the discourses of knowledge and risk management.

Chapter Six: The Intermingling of Emergency Responders and Materiality: How Technological Anomalies Lead to Differing Definitions of Work Practices & ICTs

Chapter Six moves to empirically examine *how* emergency technologies, as described in Chapter Five, work *in-situ.* This chapter draws on over sixty hours of participant observation and extensive interviews within both case studies. Analyzing emergency responders' interactions with technology *in-situ* uncovered how the constructed need for and the use and functioning of ICTs differed within both settings. Specifically, the *Rural* case study illustrates that emergency ICTs have led to a duplication of efforts and increased paper administration; while the *Urban* case study demonstrates that the use of ICTs has led to increased information management for purposes of workplace and societal surveillance. This chapter, therefore, uncovers and outlines the *functional* disconnect.

Chapter Six empirically focuses on the *negotiated* interaction between emergency responders (i.e., call-takers, dispatchers and emergency responders) and their technologies. Throughout the chapter, I demonstrate that these emergency work processes and their associated technologies are defined relative to their *local* and *organizational* context. ICTs, therefore, do not exist independent of their designers, users and interactional contexts. To best illustrate the *functional disconnect* between ICTs designer constructions and those of the frontline emergency responders, I first define and outline classification systems and their incorporated standards. I follow this discussion with a detailed analysis of the impact of *nonhuman actants* and *human heterogeneity* on emergency ICTs functioning within the *Rural* and *Urban* case studies[4]. The chapter concludes with a summary of the similarities and differences existing between the *Rural* and *Urban* settings.

Chapter Seven: Organizational and Social Worlds Disruptions: Examining the Impact of ICTs on the Social Problem of Emergency Interoperability

Chapter Seven conducts a broader social arenas analysis of the *collective* and *intersecting* work activities (of police officers, fire fighters and paramedics) involved in a multi-agency incident. By examining the local, situational and organizational work processes involved in a multi-agency incident, the present chapter draws attention to the multiple, and at times contradictory, perspectives and actions incorporated within emergency response. This chapter provides critical insight into *how* front-line emergency

[4] Nonhuman actants and human heterogeneity were two thematic concepts identified by frontline responders as central for creating technological anomalies that result in differing definitions of the use, need and functioning of emergency ICTs.

responders' define, understand and work towards solving the social problem of 'inadequate emergency interoperability'.

Employing a social worlds/arenas framework, I analyze the *intersection* and *legitimation* of work processes within a multi-agency incident (Strauss, 1978b). From this analysis, I argue that there is an *ideological disconnect* between emergency ICTs designers' conception of the need for and intended use of their technologies, and those conceptions held by front-line emergency responders. This *ideological disconnect*, I argue, results from varying understandings of 'emergency interoperability'. Through the application of a multi-agency 'Tiered – Response Vignette', I illustrate the important place boundary objects, specifically emergency ICTs, hold for creating interoperability and establishing social order. From this discussion, I highlight *how* the local, situational and organizational work processes of emergency responders can disrupt information and communication interoperability.

Chapter Eight: Knowledge Management or Risk Management? Concluding Thoughts and Social Implications of ICTs Function Creep

In Chapter Eight I synthesize the research findings in Chapters Five, Six and Seven to illustrate how there is a critical *functional* and *ideological* disconnect between ICTs designers' construction of emergency technologies, and the in-situ application of these technologies by emergency responders. From this synthesis, I identify four original contributions made to our understanding of: (1) the social construction of technology, and (2) the state of emergency response and preparedness.

Specifically, I argue that this study contributes to our understanding of science and technology studies and emergency response by: (1) Identifying a critical two-part

functional and *ideological disconnect* between the design and use of emergency ICTs. (2) Uncovering the multiple, and often contradictory, *definitions of emergency interoperability* held by police, fire and EMS and the important place boundary objects (emergency ICTs) hold for establishing and maintaining social order (3) Identifying the impact *organizational contexts* have on the function and utilization of emergency technologies. (4) Uncovering the *interpretive flexibility* surrounding 'information' and the important role tacit and localized knowledge hold for manipulating ICTs and eliciting emergency response.

Throughout this discussion, I identify the social implications associated with the implementation and use of emergency ICTs. Specifically, I argue that emergency ICTs have developed a 'function creep', where they are being used and adapted in ways not originally intended (Curry, Phillips, & Regan, 2004). This function creep, I argue, can lead to new forms of risk and geographical profiling that work to marginalize and discipline space. I conclude the chapter with a critique of the limitations and qualifications of the present study.

Chapter Two: Theoretical Underpinnings

Introduction

Having demonstrated how inadequate emergency interoperability has been constructed as a social problem by various politicians, ICTs designers and media personnel, I now present the theoretical underpinnings that guide the arguments ahead. In what follows, I present the key principles and theoretical concepts of contextual constructionism and social worlds / arenas theory as they relate to the present research setting and theoretical argument.

Social Constructionism

Prior to the development of social constructionism, much research on social problems was based on an assumption that social problems were objective conditions existing in a society, that could be observed and measured. For example, statistics about rates of poverty or rates of crime were routinely presented in research studies on social problems in a seemingly unproblematic way. The aim of these early 'objectivist' approaches to the study of social problems was to identify and establish the extent of these problematic conditions, their causes and impacts on society, and possible solutions.

While at first glance it may seem appropriate to explain social problems as arising from 'objective' conditions, from an interpretive point of view, it is difficult to accept a claim that some objective condition constitutes a social problem without also considering the subjective evaluations which have given rise to defining a condition in this way (Best, 2003c). This theoretical insight created significant analytical problems for the objectivist

study of social problems. The more research was conducted on social problems, the more it was argued that the definition of social conditions as social problems appeared tied to peoples' values, actions and interactions and not to anything inherent in a condition itself.

As Herbert Blumer noted,

> A social problem exists primarily in terms of how it is defined and conceived in a society instead of being an objective condition with a definitive objective makeup. The social definition, and not the objective makeup of a given social condition, determines whether the condition exists as a social problem (1971: 300).

Drawing extensively from labeling theory, which argued that nothing was inherently or objectively deviant but only became deviant through the definitions and reactions of others (Becker, 1963), symbolic interactionists and ethnomethodologists began to approach the study of social problems as arising from peoples' definitions of putative conditions as problematic. While labeling theorists argued that there was no 'objective' condition, the analyses they performed however, appeared to be grounded in objective conditions and not true to their strict subjectivist approach (Rains, 1975).

To address this inconsistency, Spector and Kitsuse (1987) argued for a new ontological and epistemological orientation that focused, not on a social condition itself, but on the interpretive construction of the condition as a social problem grounded in the activities of individuals. This new approach, entitled 'social constructionism', argued that there is no ***objective*** social problem but only *interactions that label* conditions as problematic. All social problems, therefore, are *putative* in so far as they are *constructed* by claims-makers. Thus, social problems became defined as "the activities of individuals or groups making assertions of grievances and claims with respect to some putative

conditions" (Spector & Kitsuse, 1987: 76). Within this perspective, it was argued that a condition only becomes a social problem "when it is constructed – recognized, identified, named – as a social problem" (Best, 2003c: 981).

Stephen Pfohl (1977), has provided an excellent example of an early constructionist analysis on the "Discovery" of child abuse, offering an historical, social and political account of the discovery of 'child abuse' and the various claims-makers and claims surrounding its development. Child abuse, Pfohl argued, was not an *objective* condition, but instead developed out of the definitional work of particular groups of people (specifically pediatric radiologists) with vested interests in its development. Pfohl argued,

> the 'discovery' of child abuse offered pediatric radiologists an alternative to their marginal medical status. By linking themselves to the problem of abuse, radiologists became indirectly tied into the crucial clinical task of patient diagnosis. In addition, they became a direct source of input concerning the risky "life or death" consequences of child beating (1977: 87).

Child abuse, Pfohl concluded, became recognized as a medical, and consequentially social, concern because of the vested interests of pediatric radiologists. The more people recognized and defined certain physical acts against children as 'child abuse', the more widespread and accepted as a social problem it became (Pfohl, 1977). Thus, social constructionists argue that to understand and study social problems, one must focus specifically on the interpretive actions of people (Best, 2004, 1995; Holstein & Gubrium, 2003; Miller & Holstein, 1993).

Strict Vs. Contextual Constructionism

Since the writing of 'Constructing Social Problems', a division has arisen within the constructionist camp between *strict* and *contextualized* constructionists. Strict constructionists adopt a literal interpretation of Spector and Kitsuse and focus their analyses solely on the claims-making process.

> Thus, the significance of objective conditions for us is the assertions made about them, not the validity of those assertions as judged from some independent standpoint, as for example, that of a scientist (Spector & Kitsuse, 1987: 76).

Since each person can hold varying definitions and meanings towards objects, the only thing one can know about something is the meaning people hold towards it. Strict constructionists perceive themselves as standing outside the bubble of social life while analyzing the claims-making process as it occurs within the bubble. They bracket the existence of the 'condition' and focus *solely* on the claims-making process (Gusfield, 1984; Loseke, 2003; Schneider, 1985).

Contextual constructionism, like that adopted here, remains focused on the claims-making process and the construction of meaning, but *places this activity within its context* (Best, 2003a). Contextual constructionists think it appropriate to acknowledge or make some assumptions about objective conditions, "as long as it is done carefully and as long as the questions remain tightly focused on the process of creating human meaning" (Loseke, 2003: 198).

Morever, these theorists consider themselves and their knowledge as central within the analyses, because their evaluative judgments ultimately guide the research

agenda and contribute to public and academic debates about social problems (Best, 2003a). As Best (2003a) argues:

> Constructionist analysts rarely declare that they know the truth about objective conditions. For example, even antisatanism's critics must concede that there *might* be a blood cult out there. But analysts are likely to make less explicit assumptions about objective conditions, assumptions that frame the research agenda. Thus, a sociologist who doubts the reality of the satanic menace is more likely to try to account for antisatanism's spread....than to ask how major institutions manage to ignore the blood cult ...It may be possible to avoid overt ... declarations about objective reality – but implicit assumptions about objective conditions will almost inevitably guide researchers" (117).

Constructionists, as Best argues, do not act as neutral observers of social life, nor, however, do they make claims to the validity of the objective conditions under analysis (2003a). Instead, researchers' use their implicit judgments about objective conditions to guide their research. Therefore, "while not denying that their analyses are social constructions, contextual constructionists argue that a primary focus on such matters makes sociologists' studies of social problems irrelevant to most audiences within and outside the field" (Holstein & Miller, 2003: 8). Thus, contextualized constructionists do not stand outside the bubble of social life, but are instead actively working within it.

Notably, it is contextual constructionists' selective adoption and changing definition of 'context' that is perceived as problematic by strict constructionists. Few contextual constructionists *define* or *operationalize* context. They include some aspects of materiality or structure, while ignoring others. This leaves one to wonder what exactly the concept of 'context' includes or excludes? Numerous contextual constructionists

incorporate different aspects of context such as 'official statistics' and 'structural constraints', while maintaining analytical focus on the claims-making process (Best, 2003d; Stallings, 1995).

For example, Joel Best (2003b) studied the claims-making process informing the emergence of "random violence" as a social problem. In this case study, the analysis did not focus on *how* the claim was made durable, but instead focused on counter-statistical evidence that revealed "that claims of society-wide deterioration are exaggerated and overly simplistic" (Best, 2003b: 117). Best, therefore, argued against the validity of claims-making about the increase in random violence through the use of alternate statistical evidence considered 'factual' but which, it could be argued, was also socially constructed. This has led many strict constructionists to argue that contextual constructionism moves beyond the data under study and away from the claims-making process, leading the analyst to get "sidetracked into theoretically unproductive issues" (Troyer, 1992).

Selective Objectivism & Defining of Context

The claim of 'selective objectivism' is a common criticism leveled against constructionist accounts. Both strict and contextual constructionists have been accused of selective objectivism, because their studies assume "that social construction processes are observable aspects of social worlds that exist separately from social constructionists' descriptions of them" (Holstein & Miller, 2003; Miller & Holstein, 1993: 6). Woolgar and Pawluch, for instance, argue that the success of a social problem explanation depends on "making problematic the truth status of certain states of affairs selected for analysis

and explanation, while backgrounding or minimizing the possibility that the same problems apply to assumptions upon which the analysis depends" (1985a: 216). For Woolgar and Pawluch, both strict and contextual constructionists participate in ontological gerrymandering (1985a).

To illustrate the concern over ontological gerrymandering let us return to Pfohl's study on the 'discovery' of child abuse. Nowhere in his analysis did he discuss the adequacy of the evidence of child abuse; instead the evidence of child abuse is taken as an *objective fact.*

> By highlighting the involvement of definitional work, Pfohl argues that child abuse was not discovered but created by certain medical interests. The use of quotation marks suggests Pfohl is carefully attempting to distance himself from the position that child abuse is a real objective fact. At the same time, Pfohl effectively backgrounds or conceals the constructed character of other key concepts....For example, we notice that although there are quotation marks around the word "discovery", there are not quotation marks around the word evidence. For Pfohl, it was evidence that was available, not "evidence" (Woolgar & Pawluch, 1985a: 220).

While constructionists argue that their studies focus specifically on the interpretive claims-making process, their analyses are built upon taken-for-granted, objective conditions and claims.

Like Joel Best, I believe that the criticism surrounding ontological gerrymandering is counter-productive, as it diverts attention "away from the study of the social worlds within which and social processes through which social problems are constructed" (Holstein & Miller, 2003: 8). The discourse and rhetoric used by claims-

makers and social world participants reflects particular cultures and social structures. Thus, language does not exist independent of its context, but instead is a product of it (Best, 2003a). To understand how social realities are constructed and what comprises those realities, researchers must address the *context* in which this occurs.

In this research study I define *context* as something actively and interactively constructed by actors (Holstein & Gubrium, 2003). Context is not conceptualized as a reified state, but as a fluid and ever changing human-material construction. By adopting Holstein and Gubrium's conception of context, as something actively constructed, I can maintain analytical focus on the actions, interpretations and claims-making processes of my research participants, while locating these actions within their local and situational work processes (2003). To facilitate the analysis of claims-making within its contextual setting I adopted Anslem Strauss's social worlds / arenas theory (1978b).

Social Worlds / Arenas Theory

Social worlds / arenas theory is concerned with the ways in which actors' define and interpret their social interactions. This theoretical perspective is rooted within the symbolic interaction paradigm and has made significant contributions within the sociology of work and science and technology studies (Clarke & Gerson, 1990). Social worlds / arenas analysis is "centered around examining what people do as well as what they say they do, situated in the larger contexts of careers, materials, techniques, theories, organizations, and professions" (Clarke & Star, 2003: 539). Social worlds / arenas analysis is a theory of action that analyzes the local and locally contingent aspects of

work. Like symbolic interactionism, the social worlds / arenas framework recognizes that social life is interpretive, reflective, negotiable, relational, and processual (Blumer, 1969; Prus, 1996, 1997; Strauss, 1993).

Social Worlds

Social worlds as a concept refers to a set of common or joint activities connected together by a network of communications (Strauss, 1984). While social worlds involve universes of discourse, analytic attention should also be paid to their respective "activities, memberships, sites, technologies, and organizations typical of particular social worlds" (Strauss, 1978b: 121). Social worlds can range from a recreation group (e.g., chess team or football team) to an occupation (e.g., policing) (Clarke & Star, forthcoming).

Each social world revolves around at least one primary activity, for instance the social world of fire fighting revolves around the activity of fighting fires (see Chapter Four for a detailed description of the various social worlds within emergency response). Social worlds are processual, activity-based and incorporate a physical site where activity takes place (e.g., police station, fire hall, EMS communication centre, etc.). They may also contain technologies that act as innovative tools for carrying out social worlds activities (such as Computer Aided Dispatch (CAD) Systems, Mobile Data Terminals (MDTs), etc.).

Social worlds vary in size, organizational complexity, technological sophistication and geographical dispersion (Strauss, 1984). "Social worlds are loosely or rigidly

structured units in which people share resources and information. They are characterized by a commitment to common assumptions about what is important, and what should be done" (Garrety, 1997: 731). Members of a social world build *shared ideologies* that guide their interpretive understandings, definitions of a situation, and work to shape how people go about their activities within their social world (Clarke & Star, forthcoming; Strauss, 1984). By analyzing social worlds, one can be attentive to the way actors create meaning, define work situations, interact with shared objects, and develop collective and collaborative action (Clarke & Star, forthcoming).

Social worlds are a major feature of contemporary society, with everyone belonging to at least one social world and most belonging to several. Social worlds are neither fixed nor homogenous, but fluid and heterogeneous. Because people belong to multiple social worlds, with varying and differing actions and interpretations, social worlds also contain multiple perspectives and ideologies. Notably, multiple perspectives can result in the *segmentation* of a social world, where subworlds develop around specialized concerns, interests and technologies, "which act to differentiate some members of the world from others" (Strauss, 1982b: 172).

For instance, within the social world of policing, there are numerous segmentations, such as patrol / field officers, hate crime analysts, bomb squads and emergency response teams. Each of these segmented subworlds has resulted from such things as: activities directed towards different types of objects (i.e., drugs, bombs, traffic violations); use of specialized technologies and skills; and, differences on ideological issues (Strauss, 1982a, 1982b, 1984, 1993; Strauss, Fagerhaugh, Suczek, & Wiener,

1985). Segmentation, therefore, involves the formation of subworlds with distinct sets of activities where actors come to define and differentiate their work activities from the activities of the broader social world (Gerson, 1983). Using a social worlds approach, therefore, provides a means for uncovering the fluid and actively constructed nature of work boundaries. This approach also uncovers how different social worlds' and segmented subworlds' activities intersect.

Social Arenas

It is within the social arena that many social worlds' activities *intersect* and foster cooperative and collective action (Strauss, 1993). A social arena is an area where participants from various social worlds come together to focus on a given issue and are prepared to act towards that issue in a particular way. Intersections arise when at least two or more lines of work come together:

> An intersection consists of a system of negotiating contexts, in which resources flow between social worlds. Such contexts form a relatively stable milieu in which information (including skills and techniques), money, and sentiments (such as prestige and loyalty) flow between work settings (Gerson, 1983: 363).

Thus, intersection across social worlds and subworlds can result from shared work activities, shared technologies or the development of common interests and ideologies (Strauss, 1993). For instance, the social worlds of fire fighting, emergency medical services (EMS) and policing become linked during a multi-agency incident, as each others' work activities intersect in a common goal of serving and protecting the public. It

is within the broader social arena of a multi-agency incident that we see how the various social worlds of policing, fire fighting and EMS are socially and materially linked through their activities and technologies.

Social arenas, therefore, involve the intersection and activity of multiple social worlds, each with its own unique ideological position and definition of the situation.

> The term "arena" is not meant to evoke the image of a circumscribed amphitheater but rather the abstract concept of a *sphere of action*, the social space where negotiation takes place. An arena brings together people with a common concern but representing different aspirations and perspectives. Arenas are composed of the social worlds through which individuals act, most visibly through the organizations that form within these social worlds (Wiener, 2000: S61, *italics added*).

Social arenas provide a means for understanding collective action in terms of its complexity, heterogeneity and fluidity. The complex and heterogeneous activity incorporated in a social world and arena includes active attempts to establish and maintain visible work boundaries (Clarke & Star, forthcoming; Strauss, 1982b). As members of various social worlds and subworlds work to establish and maintain boundaries, debates can "circulate around technological, organizational, ideological and even spatial issues" (Strauss, 1984: 134). Incorporated within this social matrix of intersecting social worlds' work activities, negotiations and debates are attempts to acquire social *legitimation* as every line of work must establish itself within the social arena as legitimate (Gerson, 1983).

Social Worlds / Arenas: Acquiring Social Legitimation

Social *legitimation* leads social world participants to question the *authenticity* of the activities and ideologies held by other social worlds. For example, when a social world such as policing segments into various subworlds (field officers, hate crime analysts, etc.) there are questions as to which of these activities are more "authentically of that world, more representative of it" (Strauss, 1978b: 123). Authenticity, therefore, pertains to the quality of different forms of action and imposes judgments on which acts are more essential or necessary than others (Strauss, 1978b, 1982b, 1984). Within the larger social world, "organizations or subworlds, not just persons, may compete for claimed and awarded authenticity" (Strauss, 1978b: 124). Social worlds and subworlds engage in a number of legitimation processes to have their activities and ideologies recognized as authentic and legitimate (Miall & Miall, 2002).

Questions pertaining to a social worlds legitimation "arise not only from segmentation and intersection, but from technological, spatial, and organizational considerations" (Strauss, 1982b: 174). Social worlds can attempt to acquire legitimation through a number of social processes. First, social worlds can *claim worth* by identifying their specialized training, skills and technologies. By claiming worth, the social world is asking for recognition of its uniqueness and distinctiveness from other social world activities.

Second, social worlds can engage in processes of *distancing.* Distancing includes active attempts to differentiate one's activities from others, but more importantly to define one's activities as more 'legitimate' than the others (Strauss, 1982b). Third,

social worlds can engage in processes of *theorizing* where members of social worlds establish ideational positions that attempt to "decry, debunk, seek to discredit, even get in-world or governmental rulings to squash" other social world activities, while simultaneously claiming that one's own work is essential and authentic (Strauss, 1982b: 176).

Fourth, social worlds can attempt to set standards, which can pertain to "whether a given activity…is 'really' authentically reflective or representative or appropriate to the character of a given social world" (Strauss, 1982b: 180). Setting standards can include the development and enforcement of standard operating procedures or legal standards and mandates over one's work activity. Fifth, social worlds can set work boundaries which pertain to outlining what activities, technologies and ideologies are truly reflective and representative of the social world (Strauss, 1982b). This allows people both within and outside of the social world to identify what and who is part of distinct social worlds. Legitimation processes, therefore, work to maintain and confirm work boundaries by organizing the flow of activities among social worlds (Gerson, 1983).

Intersecting Social Worlds and Boundary Objects

Social worlds / arenas theorists have developed the concept of '*boundary objects*' to better understand the intersections of social worlds and arenas (Clarke & Star, 2003). Boundary objects are tailored in local use, but fluid and malleable for collective and collaborative work among various social worlds and arenas (Star & Griesemer, 1989). They have the ability to construct cooperation among multiple intersections of work

processes across distinctly different social worlds (Star & Griesemer, 1989). Boundary objects can be both people and things, such as sales representatives, information technologies, classification systems for users in different settings (for interesting empirical studies on boundary objects see: Carlile, 2006; Miall & Miall, 2002; Orr, 1996; Sanders, 2006).

A "classification system is a set of boxes (metaphorical or literal) into which things can be put to then do some kind of work – bureaucratic or knowledge production" (Bowker & Star, 2000: 10). Although boundary objects are rigidly structured within their local use, they are fluid and loosely structured in collective work.

> Here the basic social process of translation allows boundary objects to be (re)constructed to meet the specific needs or demands placed on it by the different worlds involved… Boundary objects are often very important to many or most of the social worlds involved and hence can be sites of intense controversy and competitions for the power to define them. The distinctive translations used within different worlds for their own purposes also enable boundary objects to facilitate cooperation without consensus (Clarke & Star, forthcoming: 217).

Boundary objects, therefore, emerge through work processes and facilitate the multiple transactions needed to construct agreement among the various social worlds. By their very definition, boundary objects are fluid and hold varying meanings, identities and functions depending on where one is localized within the social world (Mol & Law, 1994).

Boundary objects are the researcher's pathway into complex and heterogeneous work processes because they enable the researcher to analyze how various social world

participants' take up, define and use them within the situation of interest (Clarke & Star, forthcoming). Thus, analytical and methodological goal of social worlds / arenas theory is to empirically identify all of the actors and elements involved in the collective action. Social worlds / arenas analysis contends that by representing the full array of situated knowledge related to a particular phenomenon under study, the multiple voices and selves, both active and silent, can be identified[5] (Clarke & Montini, 1993). Analyzing the intersecting and collective action occurring within a social arena renders visible the numerous conflicts and resistances. Furthermore, engaging in a social worlds / arenas analysis permits a study of not only communication, symbolization and discourses, but also of social world members' activities and technologies (Strauss, 1991).

A social arena is also concerned with questions about policies and directions of action (Strauss, 1993). It is within social arenas that political activity and organizational issues are fought out (Strauss, 1984). However, Strauss maintains that

> Arenas exist at every level of organizational action, from the most microscopic to the most macroscopic. As whirlpools of argumentative action, they lie at the very heart of permanence and change of each social world. By the same reasoning, arenas are central to the creation and maintenance of social order…(1993: 227).

Examining activity within a social arena, such as that of emergency response, provides insight into the complexity inherent within the various social worlds, but also provides

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[5] Arenas analysis takes account of those present within the arena, but also those silent and implicated. Implicated actors are, "actors explicitly addressed by a social world … but who are not present or fully agentic in the actual doings of that world…Social groups with less power in situations tend to be implicated rather than fully agentic actors" (Clarke & Star, 2003: 547)

insight into their intersecting work practices for constructing and maintaining social order.

Analyzing the ways in which social worlds work processes intersect sheds light on how their standards and modes of action are put into question and lead to local work-arounds and adjustments to work processes. As I argue in Chapter Seven, for example, intersecting and collective action within emergency response can lead to different understandings and definitions of emergency interoperability and the use of emergency ICTs. These varying ideological positions can in turn lead to further processes of segmentation, intersection and legitimation (see Chapter Seven for a detailed discussion of these processes).

A social constructionist and social worlds analysis, therefore, does not characterize organizations and social structures as immutable, but instead sees them as being constituted by action but also shaping action (Strauss, 1993). Social structures and organizational structures result from prior actions but become sustained through the present activity of social world members and are experienced as obdurate (Clarke, 1991). Similarly, organizations and social order are negotiated, temporal and local. Organizations are constructed through the negotiations and actions of workers both on and off the scene (Strauss, 1978a). Structures, as Clarke argues, are temporal conditions of situations that are obdurate and intrusive and must be taken into account along with the social processes and activities that gave rise to them (1991). The usefulness of social worlds / arenas theory is that it recognizes that phenomena and interactions are temporal and "despite structural constraints, interactants actively attempt to shape and manage

their courses through their interactions" (Strauss, 1993: 70). Again theoretical attention is on *action*, the interactively constructed nature of being, but places this active construction within its contextual background.

Incorporating Materiality

The use of social constructionism and social worlds / arenas theory uncovers how organizations are locally and situationally constructed. Social worlds / arenas theory not only places analytical attention on workers' activities and definitions, but also on the structural contexts and material realities that influence, shape and guide the construction of social order. Many studies using organizational theories have had difficulty conceptualizing the role of technologies because they have not been able to distinguish between the technical and the social without reifying them and treating them as separate and distinct entities (Clarke, 1991; Latour, 1987b, 1991a; Latour & Callon, 1981). The social and technological, I argue, are co-constituted (make each other up). The term co-constituted has been used by symbolic interactionists and science and technology theorists to describe the interconnected relations among humans and nonhumans (Clarke & Star, 2003; Fujimura, 1992; Latour, 1987b; Law, 1991b).

Early interactionists' research on the co-constituted relationship of humans and materiality has included studies on research materials and technology (see for example Clarke, 1990; Clarke & Montini, 1993). As Clarke and Star argue, "assuming that nonhuman entities are meaningful actors and constitutive or agentic in the making of science is a hallmark of contemporary interpretive approaches" (2003: 553). It is the

analytical attention paid to materiality that makes the use of social worlds / arenas theory valuable as an approach for studying work, organizations and science and technology. Symbolic interactionists, such as Adele Clarke, Susan Leigh Star and Joan Fujimura, have used the concepts of social worlds and social arenas to analyze how scientists and researchers create knowledge. These studies have uncovered that the social worlds of research and science are not objective, stable entities, but instead exist through ongoing negotiations and are composed of differences of perspective (Clarke & Star, 2003).

Social worlds / arenas theorists argue that to capture the co-constituted relationship, one must study the situation where work occurs and include all analytically pertinent human and nonhuman actors.

> That is, an arena can itself be construed as an extended situation including all the technologies, materials, and so on, that are salient to it. Nonhuman actants structurally condition the interactions within the situation through their specific properties and requirements – the demands they place on humans who want to or are forced to deal with them. Their obdurancies must be routinely taken into account by other actors (Clarke, 1991: 139)

Since social worlds / arenas theory is attentive to humans and nonhumans, it draws many comparisons to 'actor-network theory' (ANT). Actor-network theory, like social worlds / arenas analysis, is concerned with the collective social negotiation of meanings by emphasizing action and process, while dismissing deterministic macro-social theorizing (Latour, 1987b).

Social Worlds / Arenas and Actor-Network Theory

Bruno Latour and Steven Woolgar were two of the first ANT researchers to emphasize the everyday work contingencies and social construction processes embedded within and driving scientific laboratory work (Latour & Woolgar, 1979). Actor-network theorists argue that the activity of humans and nonhumans continually interact together to help establish and maintain social order (Pickering, 1995). ANT, similar to social worlds / arenas theory, argues that, "action is not what people do, but instead the "fait – faire," the making do, accomplished along with others in an event, with the specific opportunities provided by the circumstances", such as the nonhuman actants (Latour, 1991b: 281). While there are many similarities between social worlds / arenas research and ANT, the two are competing analytical frameworks.

Although, within the study of science and technology, both theories argue that social relations rely on durable materials and conceptualize structure as resulting from the interaction and perspective of its actors, the two hold differing epistemological stances on the role of nonhuman actants. Both theories argue that nonhuman actants are not fixed objective entities that all people use and incorporate in the same way, but instead are tools used by individuals in differing ways throughout social interaction (Latour, 1987b; Law, 1991a; Pickering, 1995). An object's function within both approaches can vary in use from person to person, but has the capability of connecting people and interactions to one another and thus requires analytic attention (Clarke & Gerson, 1990; Latour, 1987a). Where the difference lies is in how they conduct their analysis and, more importantly,

how the two frameworks conceptualize and methodologically take account of nonhuman *actants*.

Although there are numerous discussions of the epistemological differences between ANT and social worlds / arenas theory (see for example: Casper, 1994; Clarke & Gerson, 1990; Clarke & Star, forthcoming; Garrety, 1997), I will provide only a brief comparison of the two below. In ANT, researchers follow the 'technoscientist' around the social network. In this approach, researchers focus on the most powerful actor as he or she makes connections and interacts with other human and nonhuman actants (Latour, 1999a)[6]. ANT is not interested in differences among actors, but whether or not they are part of the network (Garrety, 1997). For social worlds / arenas theory, on the other hand, the role of the researcher is to empirically identify all of the relevant human actors and nonhuman actants and to "view the constructed world metaphorically over the shoulders of all the actors" (Clarke & Montini, 1993: 45).

Thus, social worlds / arenas theorists conduct situational analyses of all relevant actors, including human, nonhuman and those implicated in the situations of interest. This situational analysis invites an analysis of difference. By attempting to empirically view the world in the actors' own terms,

> multiple visions and means of achieving them are highlighted...[and]...by not analytically recapitulating the power relations of domination, analyses that represent the full array of situated knowledge related to a particular phenomenon turn up the volume on the

[6] One of the most prominent and well cited studies is Bruno Latour's analysis of Louis Pasteur (Latour, 1988). In this analysis, Latour illustrates how Pasteur made connections with humans and nonhumans and translated their interests into his own to reach his final goal. Within this fascinating report, which does draw attention to the numerous human and nonhuman acts that bind together and make durable social relations, the main focus is upon the work of Pasteur himself.

> quiet, the silent, and the silenced (Clarke & Montini, 1993: 45).

As Joan Fujimura notes, one of the biggest differences between ANT and social worlds / arenas analysis is that the latter is still sociologically interested in understanding how and why some perspectives and definitions of the situation win out over others (1991).

A theoretically significant difference between ANT and social worlds / arenas theory lies in their respective epistemological orientation toward nonhuman actants. ANT is a semiotic form of network analysis that argues nonhuman actants should be given equal status with humans in their construction of knowledge, and in some cases the researchers' privilege nonhuman actants (see for example Latour, 1995). Thus, ANT places considerably more *agency* on nonhuman actants than does social worlds / arenas theory.

Nonhuman Actants, Black Boxing and Immutable Mobiles

The present research adopts a social worlds perspective of nonhuman actants as present and essential in social interaction. Throughout the research, I regard materiality and human agency as *intricately connected* with each other (Latour, 1995; Law & Callon, 1995; Pickering, 1995). Pickering (1995) refers to this reciprocal and interconnected relationship as the 'mangle of practice', where humans are working with objects to construct social order. Humans have to *negotiate* their goals, intentions, understandings and activity in response to *materiality*.

In what follows, I argue that there is a difference between human agency and the action and presence of materiality. To maintain an epistemological distinction between

human agency and materiality, I refrain from describing the presence and implication of materiality as forms of material agency. Instead, I use the term *actant*, as borrowed from semiotics, to draw attention to the important presence of materiality within the socio-material construction and maintenance of social order. Like other social worlds / arenas theorists, I do not regard nonhuman actants as possessing *agency*, or as being in a symmetrical relationship with human actors. Instead, I recognize the inclusion of nonhuman actants and materiality as providing yet another means for understanding how social order is interactively co-constructed and maintained.

Drawing from science and technology studies, I argue that nonhuman actants become powerful tools capable of connecting people, both known and unknown, to each other (Latour, 1987). Nonhuman actants are not apolitical objects, but instead incorporate the various political subjectivities of their designers. However, the social make-up and construction of nonhuman actants becomes *black boxed* and rendered invisible because of the numerous ways they are unquestionably adopted and used by human actors (Latour, 1987). A "black box moves in space and becomes durable in time only through the actions of many people;… understanding what facts machines are is…understanding who the people are" (Latour, 1987: 137). Nonhuman actants, such as emergency ICTs, contain multiple memberships, negotiations and complexities. Of interest for the present dissertation is not only how emergency ICTs contain invisible, multiple memberships and negotiations, but also how these technologies are transportable and adaptable across the various subworlds and social worlds of emergency response. Emergency ICTs, therefore,

are not merely black boxes, but they are also *immutable mobiles*, inscriptions that have the ability to travel unchanged across space and time (Latour, 1987b, 1999b)

While materiality can bind people together without their conscious awareness of these connections, it can also lead to the intersection of work processes. It is not objects alone that actively enroll and translate peoples' interests. It is people interacting together and defining their interactions that construct the objects to function for them to attain their desired goals. Intentionality and culture, I argue, present many contradictions to actor-network theorists' argument for leveling humans and nonhumans. It is humans' culture and interests, I argue, that drive the construction, application and use of objects. Not only does our intentionality lead us to construct and maintain objects, but it is also our intentionality and cultural understandings that enable us to repair and negotiate the use of objects. For instance, Chapter Six illustrates the negotiative labour required by emergency responders and their ICTs to elicit emergency response. Specifically, when a cellular phone call reaches 9-1-1, it is not accompanied by a standardized address. Instead a caller's address is acquired through the negotiative labour of the 9-1-1 call-taker, caller and Computer Aided Dispatch (CAD) System. The present research sheds light on the impact that emergency ICTs have on the labour and work processes of emergency responders.

Benefits of Using Contextual Constructionism and a Social Worlds / Arenas Framework

Employing contextual constructionism and a social worlds / arenas framework provides three specific benefits for grasping the intermingling of emergency workers and

ICTs for constructing emergencies and eliciting response. First, social worlds / arenas theory incorporates aspects of negotiated order, as people and objects negotiate together to co-construct social order. Negotiated order takes into account structural impacts as well as interpretive processes (Fine & Kleinman, 1983). Order and disorder co-exist and it is through collective action that social order develops; thus, social structure is ongoing action (Maines, 2001).

Second, being analytically attentive to the negotiated order that takes place within the situation of interest places collective activity as the unit of analysis, making it observable and concrete for studying peoples' everyday work activities (Hall, 1987). *Situation*, as used here, is "broadly conceived" and defined to include all human and nonhuman elements incorporated within emergency response (including both multi-agency and single agency emergency responses) (Clarke, 2005: 86). Conducting a situational analysis enables one to follow the various actors and actants incorporated within the situation to see how meanings, actions, interpretations and identities are constructed. It further identifies the collective co-construction of social order. It is a sensitizing approach which allows the researcher to learn from the actors without imposing prior judgments of how social order arises and is maintained.

Third, contextual constructionism and social worlds / arenas theories provide a means for conducting a situational analysis of emergency response. Emergency and Protective Services (EPS) is an organization that is made up of a number of social worlds, such as 9-1-1, police, fire fighting and EMS (see Chapter Four). In order to understand how EPS functions, it is vital to understand how each social world operates

independently as well as inter-dependently. Using situational analysis enables me to capture the complexity of social life. Specifically, a situational analysis,

> captures the nature of this fluid, complex, heterogeneous, and mobile society. . . .It provides a means to observe variation in involvement, integration, and coordination. . . .Finally, [it] provides an empirical and conceptual means for bridging social worlds and action contexts (Hall, 1987: 12).

Incorporating contextual constructionism with a social worlds / arenas framework provides a means to perform a dynamic and flexible analysis of social order that maintains interaction, particularly collective action with humans and nonhumans, as central throughout the analysis. Social worlds / arenas analysis further provides a means to analytically focus upon and deconstruct the nonhuman actants incorporated within emergency response, most specifically emergency ICTs. These technologies, although appearing straightforward, are complex entities that bind numerous actors, both known and unknown, to each other.

Concluding Thoughts: Applying Contextual Constructionism and Social Worlds / Arenas Theory to Emergency Response

As outlined in the introduction, a social problem concerning 'inadequate emergency interoperability' has been constructed by various claims- makers, including members of the media, emergency information communication technology (ICTs) designers, and government representatives. To understand the impact of emergency ICTs on emergency responders' work processes and the social problem of inadequate emergency interoperability, I adopted a theoretical framework that analyzed actions and discourses within the context of their social worlds / arenas participation. This

dissertation, therefore, is not a broad constructionist account outlining the various claims-makers and claims taken to construct and maintain the social problem within emergency response.

Rather, this research examines how the solutions provided to the social problem of inadequate interoperability (i.e., implementation of emergency ICTs) are affected by the definitions, meanings, and interpretations brought to bear on their use, including the various legitimation processes inherent in social worlds activities and the presence of nonhuman actants and human heterogeneity. The present research, therefore, examines the everyday interpretive and interactional activities of emergency responders to address important questions, such as: Do the various players within EPS hold the same definition, meaning and interpretation of emergency interoperability? Do frontline workers recognize emergency communication and information interoperability as 'important' or 'problematic'? How do the technologies put in place to address the social problem of 'inadequate emergency interoperability' impact work processes and information and communication sharing? As Holstein and Miller argue, the processes of social problems work are ongoing, locally managed, and sensitive to practical circumstances, and require attention to contextual influences (1993). Thus, the present study conducts a situational analysis of social problems work.

Performing a situational analysis of emergency response recognizes: (1) Emergency ICTs are part of the material and social environment of emergency response and are therefore subject to individual and organizational actions which can change the expected use and function of them (see Chapter Six). (2) Studying the use of emergency

ICTs identifies the problems surrounding the meaning and relevance of information. By studying the 'in situ' use of technology, the vagueness and incompleteness inherent in data and information are identified, while further highlighting the importance of emergency workers' tacit knowledge for completing their duties (see Chapter Six for a detailed discussion of this *functional disconnect*). (3) Lastly, conducting an in-situ situational analysis uncovers the varying and contradictory perspectives held toward the social problem of 'inadequate emergency interoperability' and how these differing ideological perspectives are in turn embedded within the perceived need for and intended use of these technologies (see Chapter Seven for a detailed description of this *ideological disconnect*).

Having presented both the theoretical underpinnings and epistemological compatibility of contextual constructionism and social worlds / arenas theory, I now turn to a detailed description of the situational analysis undertaken.

Chapter Three: A Reflexive Account of Participating within the Social Worlds of EPS

Introduction

Unlike other chapters, the present chapter acts as a reflexive account of the data collection and analysis process. It is filled with detailed descriptions and examples of the methods used, as well as reflections on the contingencies that affect qualitative field research.

When I set out to examine the social construction of information and communication technologies (ICTs) within Emergency and Protective Services (EPS), I wanted my methodology to be directly connected to and defined by my ontological and epistemological positions. In order to grasp *how* emergency workers and ICTs designers perceive, define and act towards emergency technologies, I adopted social constructionism and a social worlds / arenas theory as my guiding theoretical and methodological framework (Clarke & Star, forthcoming; Loseke, 2003). To take account of peoples' varying meanings, perspectives and actions, I engaged in participant-observation and in-depth interviewing with ICTs designers and emergency workers. These methods enabled me to keep research participants' actions and interactions central for analysis, while further placing these actions within their contexts.

I wanted a methodology that was flexible and accountable to my research participants' constructions of reality, while simultaneously being attentive to my role and influence throughout the research process. Unlike strict constructionists, who view

themselves as analytically separate from their research participants and final analyses (Loseke & Best, 2003; Rafter, 1992), I do not see myself as standing outside of or above the community of practice under study (Becker, 1967) . In contrast to Anselm Strauss, I do not perceive the researcher as a blank slate. Rather, I acknowledge the potential influence of my own theoretical and substantive preconceptions on the research I was undertaking (Charmaz, 2006; Clarke, 2005; Clarke & Montini, 1993). Thus, I continually challenged myself to remain reflexive and open to new ideas during data collection and analysis to ensure that I did not remain fixated on my *a priori* understandings (Hall, 2001).

In the pages that follow, I provide a detailed account of my research methods and the steps taken to ensure the accounts and activities of my research participants remained the central focus of analysis. Although this chapter is presented in an ordered and sequential manner, from gaining entry, collecting, and analyzing data, the actual process was anything but linear. Like most qualitative research projects, this research contained many twists and turns, with ongoing and simultaneous data collection and analysis (Charmaz, 2006; Glaser & Strauss, 1967).

Gaining Entry

Once I had decided on my research questions and what constituted examples of the social reality I was studying, I *strategically* chose two case study locations. My *Rural* and *Urban* locations (as described in Chapter Four) were chosen for two specific purposes. First, I chose these locations because of their diverse population sizes and my own *preconceived* notion of their technological sophistication. I believed that the *Urban*

setting, where I had spent time doing my Master's thesis research, was technologically sophisticated in comparison to the *Rural* case study. I thought this technological difference would provide an interesting contrast in the technologies used, the interpretations adopted, and the organizational contexts situated within both settings.

Second, I chose them based on my familiarity with the *location* and *people* working within the various social worlds of emergency response. I recognized the difficulty of gaining entry and access to fire, EMS and policing and therefore chose the locations where I thought I would have access to gate keepers. Like many experiences with qualitative research, once I entered the field I quickly came to realize how wrong my preconceptions were! For instance, when I first entered the research field, my primary goal was to look at what I had assumed were two *technologically distinct* emergency services and to assess how the varying technologies were leading to different levels of emergency preparedness and response. Initially I was going to explore three interrelated research questions:

> *Question 1:* How do social actors and material actants work together to co-construct emergency response and establish social order?
> *Question 2:* How does interoperability between emergency agencies impact the labour and organizational processes of emergency workers?
> *Question 3:* What role do information and knowledge have within emergency response and emergency ICTs?

However, after spending time in the field and interviewing participants, I began to see that the data I was collecting led me in a different direction. I quickly came to recognize that my participants held varying definitions and perspectives toward the need for and the importance of 'emergency interoperability'. Furthermore, I began to notice that a

participant's definition of and perceived need for information and communication sharing impacted the use and function of emergency technologies.

In response to these observations, I adjusted my questions to more adequately reflect the activities, perspectives, and meanings of my research participants. For example, I began to ask my participants to define and explain what 'emergency interoperability' meant for them and to explain how they perceived the need for information and communication sharing between police, fire and EMS. Placing analytical focus on my participants' meanings provided a means for my analysis and conceptual understandings to be grounded within my participants' experiences and actions and not in my own *a priori* conceptions (Charmaz, 2006).

Before entering the field, I applied for and received ethics approval from the McMaster University Ethical Review Board. Once I had received this approval and had some preliminary background information gathered on my two case studies, such as geographical boundaries, dates of amalgamation and population size, I began to contact their respective Emergency and Protective Services. Since I had conducted an ethnographic study on 9-1-1 call-taking in the *Urban* case study three years earlier, I re-connected with past participants (Sanders, 2003). From these old contacts, I acquired access to EMS, fire communications and 9-1-1. However, while past contacts proved beneficial for acquiring access in some areas, it was through the help of a police officer that I was able to gain entry into the police department.

A personal friend put me in contact with her brother-in-law, Matthew, who was a police officer within the *Urban* setting[7]. Matthew took a keen interest in my research project and quickly scheduled me for a number of police ride-alongs. He also put me in contact with a number of other police officers and technology support staff who he thought would be 'approachable'. Matthew proved invaluable to me for gaining access, acquiring participants, and most importantly for achieving legitimacy and trust within the research field. For example, due to Matthew's support and enthusiasm for my research, the police department allowed me entry without any legal complications or obligations. This was not my experience within the *Rural* police department.

Matthew also took me to a social function where I was able to network with other officers and acquire more participants. At this social function, I was surprised by the various officers' enthusiasm about my research and their implicit trust in me as a 'legitimate' researcher. At first, I thought the immediate trust and access to the research site was connected to my extroverted nature, young age and gender. However, when I inquired into the enthusiastic response and lack of skepticism by my participants, many officers noted that I must be okay if Matthew was recommending me.

I quickly began to realize that my association with Matthew had not only provided me access and contacts to people in the field, but more importantly had provided me with legitimacy and trustworthiness. Matthew not only got me access to the police department but he also put me in contact with a fire fighter. This fire fighter was

[7] In order to maintain the anonymity of my gate keeper, I have provided him with a pseudonym.

more than willing to help me out. Not only did the fire fighter participate in the study, but he also provided me with the names of other research participants.

I used similar methods for gaining entry in the *Rural* case study. I knew a number of people living in the municipality and I asked them for a list of names and numbers of people working within emergency response. From these names and numbers I compiled my preliminary list of research contacts. I also went to social functions where I would introduce myself to paramedics and volunteer fire fighters. The first place to which I acquired access was the fire department. I knew a couple of volunteer fire fighters and was able to set up interviews with them and accompany them to training sessions. Through these contacts, I was introduced to the Fire chief, who was kind enough to participate in the study. It was also through these fire fighters that I gained the names and contact information for the EMS ambulance director and a couple of paramedics.

My second advantage was having a relative within the *Rural* police department. Although this relative did not work within the municipality of interest, he did have the names and contact of the *Rural* police communication supervisor. I drew on this 'social tie' to connect with future participants. For instance, I had my relative initiate e-mail contact and introductions between myself and other officers in the communication centre. Once officers realized my 'social tie', they were more than willing to participate in my research and grant me access to the police communication centre (Hoffman, 1980).[8]Once in, communication workers were more than happy to speak with me and participate in the

[8] Much has been written on the use of social ties for acquiring research participants and informants. For instance, Joan Eakin Hoffman discusses the value of acquiring contacts through social ties in her study of hospital boards of directors and their upper-class members (1980).

research. These participants not only allowed me to interview them, but they also encouraged me to stay and watch them work. I believe that my past research experience in 9-1-1 / police call-taking helped me develop good rapport and trust with my participants. For instance, my understanding and appreciation of call-takers' and dispatchers' work processes facilitated communication and relationship building with my participants. This previous call-taking and dispatching experience helped me gain my participants' trust.

The *Rural* police communication supervisor also took an interest in my research and contacted the two EMS communication centre supervisors to see if they would also be willing to participate in my study. Thus began my entry into EMS communications. During my interview with an EMS communication supervisor, he invited me to stay and work in the call-centre for the day with some of the dispatchers. I took him up on this offer and ended up returning to the site on two other occasions to conduct follow-up interviews and engage in further participant-observation.

The most difficult task, and in many ways the only roadblock experienced, was in gaining entry to the *Rural* police Information Technology (IT) department. While numerous officers had already participated in interviews and allowed me to observe them working, I had a lot of difficulty gaining access to the head office. Again I relied on my relative for a list of contact names and numbers of key people within the IT department. I really wanted the opportunity to interview officers working specifically with the Computer Aided Dispatch (CAD) system, Records Management System (RMS) and the radio system within the police department. Trust in my research was not as apparent at

this level as it had been with the frontline officers. There was a lot of concern over my 'true intentions' and also my ability to keep the research data secure. There were also concerns about my knowledge of police IT developments. In order to acquire access to the IT department and to conduct interviews, I had to enter into a lawful research agreement, entitled *Research Agreement: Freedom of information and protection of privacy,* through their research department[9]. Once a mutually agreeable research agreement had been established, entry and data collection within the head office progressed smoothly.

Collecting Data: Constructivist Grounded Theory

Once I was in the field, I began to collect data in a variety of ways. Since I was employing a contextual constructionist theoretical paradigm in my research, I wanted a methodology that was directly connected to the interpretive basis of constructionism. I wanted the data themselves to revolve around the actions and meaning-making processes of my participants. But I also wanted to be attentive to the material objects used and the contexts within which the work was completed (Charmaz, 2006).

At first I thought of using grounded theory because it regards the subject and his / her meanings and actions as central to the analysis (Glaser & Strauss, 1967). However, there are aspects of grounded theory that did not fit well with my own ontological and epistemological position. For instance, I did not want to: (1) take a positivist / realist

[9] As proscribed and / or prohibited by law under the Freedom of Information and Protection of Privacy Act (FIPPA), a researcher's only legal recourse to access information from an institution (such as the *Rural* police) that falls within the meaning of private and / or personal information, is by way of entering into a research agreement that includes requirements stipulated under s. 10 of the Regulation.

position, (2) construct universal truths and generalizations, or (3) place myself as a tabula rasa within my research site (Charmaz, 2000; Clarke, 2003).

Theoretically and methodologically I am a constructionist and relativist who perceives knowledge as something always situated and partial. Since I recognize the world as consisting of partial, malleable and situated knowledges, I do not believe that I can uncover or lay claims to universal truths and generalizations (Fujimura, 1991). My research goal, therefore, was not to engage in formal theorizing, but instead to generate sensitizing concepts for informal theorizing that uncovered the range of variation, differences and compelxities embedded within my social worlds of interest (Charmaz, 2000; Clarke, 2005). Lastly, as noted earlier, I do not believe researchers enter their field sites as blank slates, but instead begin researching with "some combination of previous scholarship, funding opportunities, materials, mentorship, theoretical traditions and … assumptions…." (Clarke & Star, forthcoming: 208).

These *a priori* understandings and contextual influences, I argue, cannot be removed or 'bracketed' during data collection and analysis. Thus, theories are not 'discovered' in the field, but are instead constructed "through our past and present involvements and interactions with people, perspectives, and research practices" (Charmaz, 2006: 10). This, I argue, is not methodologically or theoretically troubling, as it is our background knowledge that helps us identify areas of interest or insight. It is what good theoretical development is built on. For this reason I adopted Kathy Charmaz's (2006) constructivist grounded theory and Adele Clarke's (2003) situational analysis.

Both constructivist grounded theory and situational analysis recognize that knowledge is partial, situated and ever changing. Both approaches take

> a reflexive stance toward the research process and products and consider[s] how their theories evolve…Thus constructivists attempt to become aware of their presuppositions and to grapple with how they affect the research…[it] fosters researchers' reflexivity about their own interpretations as well as those of their research participants (Charmaz, 2006: 131).

Both constructivist grounded theory and situational analysis build on the fundamental underpinnings of grounded theory and its attention to participants' meaning-making processes and activities. Like grounded theory, both contextual grounded theory and situational analysis provide a systematic approach to data collection and analysis that is empirical and places interaction and its surrounding context as the central focus of analysis.

Situated analysis builds on Strauss' social worlds / arenas framework with his grounded theory approach and addresses methodological issues such as "problematics of representation; questions of legitimacy and authority of both research and the researcher; de/repositioning the researcher from 'all-knowing analyst' to 'acknowledged participant' in the production of partial knowledges" (Clarke, 2003: 555). Unlike grounded theory, which focuses on individual actors and their meanings, researchers using situational analysis consider the *situation* as central to analysis. Focusing on the *situation* uncovers its "messy complexities" by identifying the human actors, nonhuman actants, silent / implicated actors (those actors not directly/actively involved in the situation) and discourses embedded within the situation of interest (Clarke, 2005: xxxv). Thus, using

situational analysis makes differences visible and silences speak (Clarke, 2005; Fujimura, 1991). As noted in Chapter Two, the situation of interest in this analysis is broadly conceived and defined to include all human and nonhuman elements incorporated within the social worlds of emergency response and their intersections in the arena of a multi-agency incident, in both *Rural* and *Urban* settings.

Field Research

In order to identify the various actors, actants and discourses involved in the situation, I employed participant-observation and intensive interviewing methods. I engaged in a total of sixty hours of participant-observation in most facets of emergency response such as; police ride-alongs and call-taking / dispatching within police, fire and EMS call centres for both case studies. Participant-observation gave me an opportunity to see how emergency responders did their job and interacted with ICTs. It further enabled me to see how emergency responders define and give meaning to their everyday work activities. Participant-observation, therefore, provided me with greater knowledge and appreciation of emergency workers' life worlds and a detailed understanding of their activity (Becker, 1986; Prus, 1996, 1997; Shaffir & Stebbins, 1991).

During my time in the field, I tape recorded numerous conversations with participants and kept detailed fieldnotes. These fieldnotes were filled with descriptions of the work my research participants did, how they defined or described what they did, and how they felt about their work. My fieldnotes also became a site for sensitive reflexivity as they quickly became filled with my own reflections, questions, emotional

reactions and thoughts about my experiences within these fields. Writing reflexively provided me with a means to be accountable to my *a priori* conceptions and understandings (Hall, 2001; Macbeth, 2001).

In addition to my field notes, I conducted 35 in-depth semi-structured intensive interviews with emergency workers and ICTs developers. Those interviewed included a general manager of emergency response, 9-1-1 / police call-takers, police officers, EMS dispatchers, paramedics, fire dispatchers, fire fighters, Bell Canada 9-1-1 managers, and CAD and RMS trainers and developers within both case study locations. During my interviews, I used a semi-structured interview schedule that combined fixed alternative and open-ended questions (see Appendix A for a copy of the interview schedule). The questions revolved around the participants' work experiences and meanings they brought to what they did, and the role of ICTs in performing their job.

Since I conducted interviews with participants from different emergency agencies and different positions, I kept the questions on the questionnaire open-ended and used them only as a rough guide. The interviews themselves followed more of a conversation than a strict back-and-forth interview format. They began with broad opening questions, such as, 'What does your job entail?', and were followed by clarifying questions. During the interview, I had each participant outline his/her respective role during a multi-agency incident (an incident that incorporates the activity of one or more social worlds) . I had each participant take me through the processes involved in a multi-agency incident from the moment the call arrived at the respective communication centre (i.e., 9-1-1, police,

fire, EMS), to the division of roles and responsibilities on-scene, to one's exit from the scene.

Since I did not always have the opportunity to follow each participant through an actual multi-agency incident, this interview technique enabled me to document the various processes and activities mandated for dealing with such a multi-agency incident. I used these thorough accounts to build a descriptive vignette (or snapshot) of the person at work. This vignette approach kept the emergency responder involved by having him / her reflect upon "a recent episode of practice, first describing it, and then producing thoughtful explanations" (Miles, 1990: 38). Having research participants develop a vignette of their work processes provided me with rich data and acted as "a useful focus for discussion during individual interviews" (Hughes & Huby, 2002: 383).

After I had collected and transcribed my participants' responses, I then put their responses together to develop a larger vignette that outlined the various processes and actions taken during a multi-agency incident as described by communication workers, fire fighters, police officers and paramedics (see Chapter Seven for the finalized 'Tiered-Response Vignette). The vignette was an extremely useful tool for me as it allowed me to see how different responders define their activity and role, theoretically at least, within a multi-agency incident (for detailed discussions on the strengths and limitations of using vignettes see: Gould, 1996; Hughes & Huby, 2002; Sumrall & West, 1998; Wilson & While, 1998).

Follow-up interview questions were developed as insights were obtained from interview participants (Lofland & Lofland, 1995). For example, during interviews with

police, fire and EMS, I began to realize that 'interoperability' had varying, and at times, contradictory meanings. Police officers defined interoperability as information and communication sharing within a police department and among other police departments, while EMS and fire fire fighters defined interoperability as the ability to communicate and share information between police, EMS and fire (see Chapter Seven for a detailed discussion). Based on this finding, I began to ask 'What does interoperability mean to you?' and 'Do you think it is important to communicate and share information with other agencies within emergency response?' These follow-up questions arose from previous participants' responses. I found this method useful for capturing the participants' own unique perspectives and meanings.

The interviews ranged from one to three hours in length and took place at a location chosen by the participant. Numerous participants wanted to be interveiwed at their workplace so they could show me how the technology worked or how they did their job. Others wanted the added confidentiality and anonymity of meeting outside the workplace. Interviews conducted outside of the workplace were held in coffee shops and one was held in the participant's home. There were also three participants who refused to have the conversation tape recorded[10]. During these interviews, I took notes and upon leaving the interview, I would spend a couple of hours writing out detailed notes on what had been said. Following each interview, I made notes on key findings or areas of interest, which I refered to as 'quick and dirty' analysis. From this 'quick and dirty'

[10] Please note that participants provided informed consent prior to having their interviews tape-recorded. Those participants who did not want to be tape-recorded allowed me to take notes during the interview. These notes were then used to create a detailed interview transcript which was checked and verified by the participants.

analysis, I identified where there were similarities between interviews and those areas that required further clarification.

Each interview was transcribed fully and uploaded into QSR Nud*ist 6, a computer qualitative data analysis software program. I also printed a hard copy of each interview and supplementary text. I kept a binder of all the interviews that I frequently returned to, so I could read them in their entirety. Transcribing full interviews provided me with a means of remaining intimately familiar with my participants' meanings and activities, thus providing a deeper level of understanding (Charmaz, 2006).

While in the field, I collected numerous texts including: police yearly activity reports, fire yearly activity reports, EMS call algorithm charts, Tiered-Response agreements, EPS community reports, police alter news magazines, EMS news magazines, call-taker / dispatching job descriptions for fire, EMS and police, ICTs brochures, newsletters and websites from Niche, Intergraph, ARISS-II, Firepro and Versaterm; Bell Canada 9-1-1 guidelines and procedures; Bell Canada street addressing guides and rules of amalgamations. These documents helped add contextual background knowledge and create a better understanding of the designers' constructions of the need for and the use and function of ICTs.

Both my interviews (thirty-five in total) and participant observation (30 hours in each location) revealed that the *Rural* and *Urban* Emergency and Protective Services were not technologically distinct. For instance, ICTs developers felt their technology provided the same communication and information sharing capabilities for both case studies. The differences in functioning and integration within the two organizations was

not a result of the technological capabilities of ICTs, but was instead directly connected to emergency workers' constructions of their work and the role/function of ICTs.

Data Analysis: Coding, Discourse Analysis, and Situational Mapping

As I have stated previously, data collection and analysis were simultaneous processes with analysis helping to refine and refocus subsequent data collection. My analysis and coding of the data involved four steps: (1) open and focused coding, (2) discourse analysis, (3) memoing, and (4) situational mapping. Like the ongoing and simultaneous process of data collection and analysis, the four stages of data analysis presented below were at times conducted sequentially, while at other times occurred simultaneously.

Open and Focused Coding

I began analyzing my data with a very open-coding process. This first step involved coding the transcripts and texts line-by-line for key themes, concepts and discourses. Using QSR Nud*ist 6, I began to develop a list of these thematic codes (referred to as free nodes in QSR language) and their corresponding transcript excerpts. These codes were given descriptive names that portrayed what activity or meaning the participants brought to them. They were, therefore, directly connected to my participants' meanings and actions. For example: peer learning, training, and Record Management System (RMS) functioning are a few of the codes developed during this first step. In total, I developed 201 codes that attempted to capture the meanings and descriptions used by my participants (Charmaz, 2006).

The second step was a focused and more selective coding process. Here I identified the key theme areas such as: ICTs constructions; rural constructions; urban constructions; technology and agency; technology and work and interoperability. This coding began to link to other theoretical findings and orientations within the social sciences, most specifically contextual constructionism and the social construction of technology. This second step was one of continual refinement (Glaser & Strauss, 1967). Each of these key concepts were then supplemented with subcategories or themes that incorporated the differing activities or meanings associated with them. For example, rural constructions incorporated: interacting with technology, defining technological functions, disrupting work practices, and technological redefining. These codes were then further refined to include sub themes, for example 'interacting with technology' was divided into: peer learning, data mining, using functions, enhancing work practices, and diminishing work practices. Thus, I began to create a tree structure for the codes.

Once I had developed a detailed list of codes, I began to search and compare my codes to see where similarities and differences lie. This comparative coding involves intense interpretation and reflection on the meaning of coded text. This is a higher order form of coding referred to as 'analytical coding' (Richards, 2005). The goal of analytical coding is to carefully interrogate one's data asking such questions as:

> What is a particular passage about? What category or categories will properly represent that passage?...Well-handled, analytical coding is a prime way of creating conceptual categories and gathering the data needed to explore them (Richards, 2005: 94)

Analytical coding identified the varying perspectives and discourses held towards the emergency technologies and their impact on the various emergency responders' work processes. For instance, *Rural* emergency responders described their technologies as tools to increase administrative duties and maintain work statistics, while *Urban* emergency responders described their technologies as tools of risk management (see Chapter Six for a detailed discussion). While analytical coding drew attention to the varying definitions and perspectives held by my participants, it also uncovered different discourses and rhetoric used between ICTs designers and emergency responders.

Discourse Analysis

In order to better understand the various discourses used by my participants, I engaged in discourse analysis. There are numerous approaches to discourse analysis and each involves a different epistemological orientation towards discourse and its functions[11]. My discourse analysis had to be consistent with my social constructionist position and my constructionist grounded theory approach. Since I regarded texts and talk as products of social construction that do not hold an absolute truth but are instead constructed by the desires, objectives and plans of their producers (Latour & Woolgar, 1979; Potter & Mulkay, 1985), my analysis became concerned with talk and texts as *social practices*. Like Potter and Mulkay, I was not concerned with producing *definitive*

[11] For instance, Wetherell and Potter describe four types of discourse analysis: first, an approach influenced by speech act theory that focuses on a systematic account of the organization of conversational exchange; second, a psychologically oriented approach that focuses on discourse processes; third, an approach that is influenced by the sociology of scientific knowledge that explores how scientists construct talk / texts to exhibit their actions as rational; and fourth, a Foucauldian approach that tries to show how institutions, practices and subjectivities are understood as products of discourse (Wetherell & Potter, 1994).

versions of participants' actions, but instead wanted to uncover the interpretive practices and discourses through which emergency workers and ICTs designers came to construct their version of emergency ICTs and interoperability (1985). I wanted to see the differences and similarities between these varying interpretive practices.

People, I believe, categorize and describe their world in ways that make it real to them and create order and meaning for them. They construct descriptions and typifications that provide an orientation and a solution to an activity, problem or situation (Best, 1995). A "description formulates some object or event as something; it constitutes it as a thing, and a thing with specific qualities" (Potter, 1996: 111). Descriptions and typifications, therefore, became the central focus of analysis. Discourse was regarded as a means of constructing and constituting one's world. I treated "descriptions as constructions and constructive", and asked how emergency workers and ICTs developers constructed their descriptions of emergency technologies, what meanings they provided to them, and what sorts of actions or meanings were produced by their talk and texts (Potter, 1996; Potter & Mulkay, 1985; Wetherell & Potter, 1994).

For example, when I examined the interview transcripts with ICTs designers and the numerous ICTs documents and websites, I began to identify two dominant discourses (see Chapter Four, for a detailed discussion). The first discourse was that of *risk management.* This interpretive practice emphasized the need for and functions of emergency technology for maintaining the safety of the general public and emergency workers. This discursive practice focuses on the positive social goals of emergency ICTs for crime prevention and officer safety.

The second dominant discourse was *knowledge management*. Knowledge management rhetoric revolved around connecting emergency workers with 'fast and accurate' information that leads to 'informed decision making'. Emphasis was placed on emergency ICTs that transformed emergency workers into 'mobile workers', able to work off–site, while simultaneously maintaining communication and information sharing capabilities with other employees. As I read through the various interview transcripts, I began comparing and making extensive notes on the differences and similarities between ICTs designers' discourses surrounding the use of emergency technologies and the discourses used by emergency responders.

Memo Writing

Step three was *memo writing*. Memoing went on throughout both data collection and coding. Throughout the research, I kept a small note book with me at all times so I could write any thoughts, questions and concerns I had. I found this very useful and it provided a way for me to keep track of insights that I might have forgotten at a later date. While coding, my memoing became more detailed. While I read and coded the transcripts, I would write notes of explanation or insights. I would also write about their connection to other theories or readings I had done previously. I would address areas of similarities or differences between my codes and my case studies. This process of data analysis was how I advanced my abstract coding to a more theoretical level (Charmaz, 2000, 2006; Corbin & Strauss, 1990; Glaser & Strauss, 1967). It also identified areas where I needed further clarification and follow-up interviews.

Through coding and memoing, I began to see how Emergency and Protective Services (EPS) networks were not networks in a traditional sense. They were not composed of stable entities with concrete boundaries, but instead incorporated numerous smaller networks and clusters that would, at times, engage in collective action, while, at other times work alone or segment off with another agency. They acted as *fluid figurations* that have variation "without boundaries and transformation without discontinuity" (Mol & Law, 1994: 661). Thus, unlike a network that maintains distinct boundaries and borders, EPS is a fluid figuration where the boundaries at times are vague and continually shifting.

Within a fluid figuration "effective actors need not stand out as solid statues but may fluidly dissolve into whatever it is they help achieve" (de Laet & Mol, 2000: 227). EPS networks incorporated both human actors and nonhuman actants. Both human actors and nonhuman actants are capable of working across and between the different social worlds of emergency response to establish and maintain social order. It was through the first three steps of data analysis that I was able to identify the complexity and multiplicity of realities embedded within EPS. This led me to step four, situational mapping and analysis (Charmaz, 2006; Clarke, 2003). I began sorting and mapping out the different relationships and players involved in EPS. These maps were at times extremely abstract and identified actors and actants, as well as different discourses and contexts.

Situational Mapping

I needed a means of accounting for this complexity and the fluid relationships found within both Emergency and Protective Services. I also wanted to be more attentive to the nonhuman elements, for example Computer Aided Dispatch (CAD) systems / Record Management Systems (RMS), incorporated within these situations because "they structurally condition the interactions within the situation through their specific properties and requirements" (Clarke, 1991: 139) . Humans and objects are not separate, but are co-constituted, reciprocally and intricately connected with each other; they reciprocally define and sustain each other (Pickering, 1995). For example, ICTs designers and emergency workers have to *negotiate* their goals, understandings and activity in response to non-human actants. Thus, I wanted my methodology to be attentive and accountable to the objects, discourses and human actors incorporated within EPS.

Employing Adele Clarke's situational analysis enabled me to do just that. Situational analysis regards the situation of inquiry as the key unit of analysis (Clarke, 2005). This approach combines social worlds/arenas framework with grounded theory and works to identify and take into account all components of the situation, including actors, nonhuman actants, discourses and the silent / implicated actors.

> The situation of inquiry is empirically constructed through the making of three kinds of maps …These maps are intended to capture and discuss the messy complexities of the situation in their dense relations and permutations. They intentionally work against the usual simplifications so characteristic of scientific work…(Clarke, 2005: xxxv).

Situational analysis is a unique form of analysis as it places theoretical attention on both the human actors and nonhuman actants involved in the situation of interest. This

approach, unlike other types of concept maps and flow charts, provides explicit and intentional inclusion of nonhuman actants (Clarke, 2005). Situational analysis places analytical attention on the semiotics of materiality and draws attention to its relational construction (Clarke, 2005). It is the analytical importance placed on materiality that made situational analysis an invaluable data analysis tool for me.

Situational analysis is accomplished through the making of three kinds of maps: situational maps, social worlds/arenas maps, and positional maps. Situational maps identify the human, nonhuman, discursive and cultural elements in the situation and analyzes the relations between them (Clarke, 2005). Social worlds / arenas maps "lay out all of the collective actors, key nonhuman elements, and the arena(s) of commitment within which they are engaged in ongoing discourse and negotiations" (Clarke, 2005: xxxvi). Positional maps present the major positions taken / not taken in the data (Clarke, 2005). For my research purposes, I did not engage in all three maps, but focused primarily on situational maps.

My situational map lays out the major human, nonhuman and discursive elements within each EPS organization. Figure One is an example of a first draft *messy abstract situational map* of the rural EPS. This map developed and continually changed throughout the research process. My situational maps include the following: Who and what things matter in the broad situation of emergency response? Who and what things are incorporated in producing 'response'? Figure One identifies *Rural* police, volunteer fire fighters, ICTs designers, Bell Canada, RMS, CAD, etc. as key actors and actants within emergency response.

I then asked myself relational questions, such as: What discourses, ideas, and concepts shape how different emergency workers and ICTs designers think about, conceive, and define 'emergency ICTs' and 'interoperability'? Figure One identifies various discourses of risk management, knowledge management, and ICTs designed by and for emergency responders, peer learning, etc., as the prominent and shaping discourses throughout the Rural EPS and ICTs design.

Figure One: Messy Abstract Situational Map of Rural EPS

Making these abstract and messy maps helps to illuminate the discourses, objects and actors involved in emergency response. Continually asking the relational questions above both helped to produce my maps and were themselves produced and constructed by them.

The situational map, as displayed in Figure One, is more of an abstract map that provided the opportunity to see all of the incorporated actors and the relations and negotiations between them. It maintains the heterogeneity that my research site required, while further incorporating the symbolic and discursive elements of EPS as framed by my research participants and myself. This analytic tool acts as a reflexive tool, making me accountable to my own theoretical position and underpinnings. "That is, the usefulness of the approaches … consists partly in helping the researcher think systematically through the design of research, especially decisions regarding future data collection" (Clarke, 2003: 561). After I created these abstract maps, I then created ordered versions of the map.

Figure Two presents a finalized and ordered version of my situational map for my *Rural* EPS and the elements, including discourses, human actors and nonhuman actants involved in the *ideological* and *functional* disconnect in emergency ICTs[12]. This map frames my argument in Chapter Seven on the ideological disconnect between ICTs designers' definition of the need for and intended use of emergency technologies, and the interpretations and understandings of the need for these technologies held by emergency responders. After devising this map, I made several copies. I then went through and

[12] Due to space restrictions I have only presented one of my *Rural* situational maps, but multiple maps were made for each case study.

drew lines from each position to the others to examine their relations. While I specified the relationship between each research element and all the others, I continued with my memo writing.

These maps proved most useful for two reasons. First, they provided a means for analyzing the various social worlds and their collective action within the social arena of a multi-agency incident. Second, producing multiple maps for both the *Rural* and *Urban* EPS enabled a comparative analysis between the two organizational contexts as well as between emergency workers and ICTs designers' constructions of emergency technologies. Situational analysis provided a means to assess the discursive differences and similarities, as well as the varying actors and objects incorporated within each research site.

Figure Two: ***Abstract Organization Disconnect Map***

Rural Case Study

Individual Human Elements/Actors
Emergency call(er)

Nonhuman Elements / Actants
ICAD
ARISSII
Niche RMS.
Niche MDT
Fleetnet and Municipal Radio
FirePro
ANI/ALI
CACC

Collective Human Elements/Actors
communication workers
9-1-1 communication workers
Police communication workers
Fire communication workers
Police officers
Fire fighters
Paramedics
IT Designers

Discursive Constructions of Collective Actors
Authenticity / Legitimation
Professionalism
Economics/ many users

Temporal Elements
Tiered Response
Major accident / critical situation
natural disaster

Political / Economic Elements
Provincial Information Act
Volunteer
Provincial Government
Regional Government
Municipal Government

Major Contested Issues / Debates
Hierarchical information sharing / information needs → police different info needs than EMS / fire
Varying importance / professionalism → varied information needs / perceived needs
Policies and procedures
Insiders/Outsiders
What is critical / important information→ Understanding of work / needs to complete work

Implicated / Silent Actors
General Public

Discursive Constructions of Nonhuman Actants
Risk Management → emergency worker safety
Information Sharing
Inter and Intra-operability

Symbolic Elements
Professionalism → pay / volunteer
Organizational control – i.e. provincial vs. volunteer
Public accountability
Emergency uniforms / civilian clothing
Independent and Joint training

Spatial Elements
Geographical boundaries / coverage areas by the various emergency workers
Distance between emergency communication centres and corresponding workers

Related Discourses
Fast response
Protection

Reflections and Conclusions

As I reflect upon my experiences in the field, there are two valuable lessons that I have learned. First, fieldwork is *work* and requires the researcher to be constantly alert and respectful of her participants' activities and routines. No matter how comfortable a researcher becomes within the research site or with her participants, the researcher must remember her role as a researcher and the moral and ethical responsibilities in that role.

As an academic researcher, I recognized that my actions and behaviors reflected on my research institution and could also influence my participants' decisions to allow future researchers entry into their workplaces. My responsibilities to both McMaster University and my research participants placed constraints on my conduct and behavior. There were many times during my participant-observation, particularly during the twelve hour police ride-alongs, that I began to feel like a 'friend' or 'colleague' to my research participants instead of a researcher. It was during these times that I found it difficult to set boundaries with regards to how much I should disclose about myself and my private life. While this was a difficult line to draw, I believed it to be an important ethical and professional line that had to be clearly defined.

Second, I learned the importance of developing trust between the researcher and the research participants. In order for research participants to open up and discuss their work without inhibition, they must feel comfortable and safe with the researcher. During my interviews with police officers, I was frequently asked 'What is your research *really* about?' At first I was confused by this comment, but later I was informed that a few years earlier a researcher had completed a study on the police department that was

completely opposite to their proposed topic. This researcher followed-up his research with a newspaper article that placed the police in an 'unfavorable' light. Once I had acquired the trust of my research participants and assured them that I was interested in the use of ICTs our discussions became more comfortable and informative.

Not only did the participants have to trust me, but I had to trust them as well. I will always be grateful to my participants for their efforts to ensure my personal safety. For instance, during one of my ride-alongs we received a frightening call-for-service. A woman called 9-1-1 to report that she was being threatened by a man with a gun. She explained that the man, who was in fact her drug dealer, was demanding his money or he was going to shoot her. As we pulled up on-scene, the officer told me to stay close behind him. In both shock and fear I turned to the officer and said, "You do realize my vest is only a down-filled vest and will not protect me against bullets, right?" The officer looked at me and said, "I will not let anything happen to you. If things get dangerous I will give you the keys and you will lock yourself in the car". Well, the officer's tone of voice and facial expression eased my nerves and I soon realized that most of my participants would put my safety ahead of their own. For that I will forever be grateful.

Now that I have provided a detailed account of my data analysis and illustrated how the theoretical position is both connected to and compatible with the methodology employed, I move on to a descriptive account of the social worlds of *Rural* and *Urban* Emergency and Protective Services (EPS).

Chapter Four: Social Worlds of Rural and Urban EPS: A Descriptive Account of the Research Contexts

Introduction

Having discussed the social problem of inadequate emergency interoperability, as well as the theoretical and methodological assumptions informing this research, I now provide a detailed description of the social worlds within the *Rural* and *Urban* Emergency and Protective Services (EPS). Emergency response is organized and structured by each municipality based on the individual needs and expectations of that municipality. There are numerous factors that play upon the overall organization and functioning of a municipal emergency response organization, such as geographical size, population and municipal finances. These factors impact each municipality differently, and have led to varying EPS organizations across Canada. The current chapter presents a detailed description of the social worlds of 9-1-1, Emergency Medical Services (EMS), fire, and police that comprise the social arena within *Rural* and *Urban* Emergency and Protective Services. This chapter also outlines and describes the organizational and technological similarities and differences between the *Rural* and *Urban* case studies.

Since both case studies utilize the universal Bell Canada 9-1-1 emergency call system, I will describe Bell Canada's role and involvement in 9-1-1. Following this, I will provide an organizational and technological description of the *Rural* case study and *Urban* case study, respectively. Specific attention is given to the layout and the governing bodies of each social world, with short descriptions of the information and

communication technologies (ICTs) that are implemented within each agency. Detailed descriptions of the ICTs' functions are presented in Chapter Five. The current chapter concludes with a brief comparative analysis between the *Rural* and *Urban* EPS organizations.

Bell Canada's Role within EPS

Any municipality using the 9-1-1 universal emergency reporting system in Canada does so through Bell Canada. 9-1-1 became operational in North America in 1968, but its high cost confined it to relatively large communities whose property tax made it possible to fund the emergency call service (Bell Canada, 2002). As one *Rural* police officer notes:

> Prior to [a particular provincial] government in Canada there were 15 different emergency call centers. Once the [particular provincial] government came into power they brought privatization into emergency response and Bell Canada took ownership of 9-1-1 (*Interview #10, Rural Police Communications IT Department*).

In 1993, Bell Canada changed the cost of 9-1-1 from the municipal property tax mill rate and placed it on individual telephone subscribers' bills, resulting in increased enrollment in 9-1-1 by many Canadian municipalities.

With this change in billing also came a change in the routing of emergency calls to the appropriate police agency, fire hall and Emergency Medical Service (EMS). In the past, 9-1-1 calls were routed based on the telephone number of the caller; however, in 1994, Bell Canada introduced a Public Emergency Reporting System (PERS), which directs calls based on the resident's address and not his or her telephone number (Bell

Canada, 2002). PERS "uses digital mapping technology to link telephone numbers to specific street addresses, thereby enhancing the dispatch of calls" (EPS, 2002a: 2)[13]. For example, when a 9-1-1 call is received, it is accompanied by the name of the telephone subscriber, the telephone number, the address where the telephone is installed, and the name of the municipality where the address is located (Bell Canada, 2002).

To provide emergency workers with a caller's telephone number and address (Automatic Number Identifier (ANI) /Automatic Location Identifier (ALI)), Bell created a Master Street Address Guide (MSAG). This works by putting

> …your name, phone number and address into a number of data bases that work together, so we know you are in a specific municipality in the right location and we would know what fire department, ambulance and police department corresponds to that address and we ensure that all of that information is paired together to arrive at your automatic number identifier [*ANI*] and your automatic location identification [*ALI*] (*Interview #35, 9-1-1 Manager*).

The 9-1-1 call displays are derived from the telephone records retained by each telephone service carrier. Whether a person is a Bell Canada subscriber or subscribes to an independent telephone company or competitive local exchange carrier, her information is still incorporated within Bell Canada's MSAG (Bell Canada, 2002). It is the responsibility of both the telephone carrier and the municipality to keep the MSAG up-to-date: "As the municipality changes street names, extends street number ranges, or adds new street names, each telephone carrier will reflect these changes in their records to

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[13] It is important to note that only landline phones and not cellular phones are incorporated within Bell Canada's public emergency reporting system (PERS). Please see Chapter Six for a detailed discussion on the incorporation and difficulties associated with the use of cellular phones.

ensure 9-1-1 accuracy for both the routing of calls and for the caller information that will be displayed"(Bell Canada, 2002).

Once a municipality is involved in 9-1-1, it is required to meet the standardized address system outlined by Bell Canada. In order to standardize municipal addressing, Bell Canada requires towns to have unique numbers and street names, thus avoiding duplicate street names and addresses. Furthermore, all house numbers must follow strict guidelines; for example, odd house numbers are located on one side of the road, and even house numbers on the other. Once the town has ensured that all addresses are unique, the information is uploaded into Bell Canada's MSAG. This street addressing guide then provides the houses with a specific zone address which is associated with a specific police, fire and EMS agency[14]. Primarily,

> Bell's main responsibility is to get the call connectivity from the primary to the proper secondary answer agency and really when that happens our responsibility is done. If we get it to the right place and we deliver ANI/ALI correctly than we have done our job (*Interview #13, 9-1-1 Manager*).

Rural Case Study: EPS Description

The *Rural Case Study* was carried out in a small *Rural* municipality within Canada. This municipality was established in 1998 when three neighboring towns

[14] It is important to note that 9-1-1 PERS uses the 'billing address' as opposed to a particular 'street address'. Since a person can have his / her phone bill mailed to any address he / she wants (for example, he / she may have it mailed to his or her place of employment, or he / she may have others pay his / her bill, such as a parent, caregiver, or guardian), the address a person chooses to report to his / her telephone service provider is the address that Bell Canada records for its standardized 9-1-1 master street addressing guide. Therefore, disruptions to emergency response can result from inaccurate addressing. For a detailed description of this technological disruption please see Chapter Six.

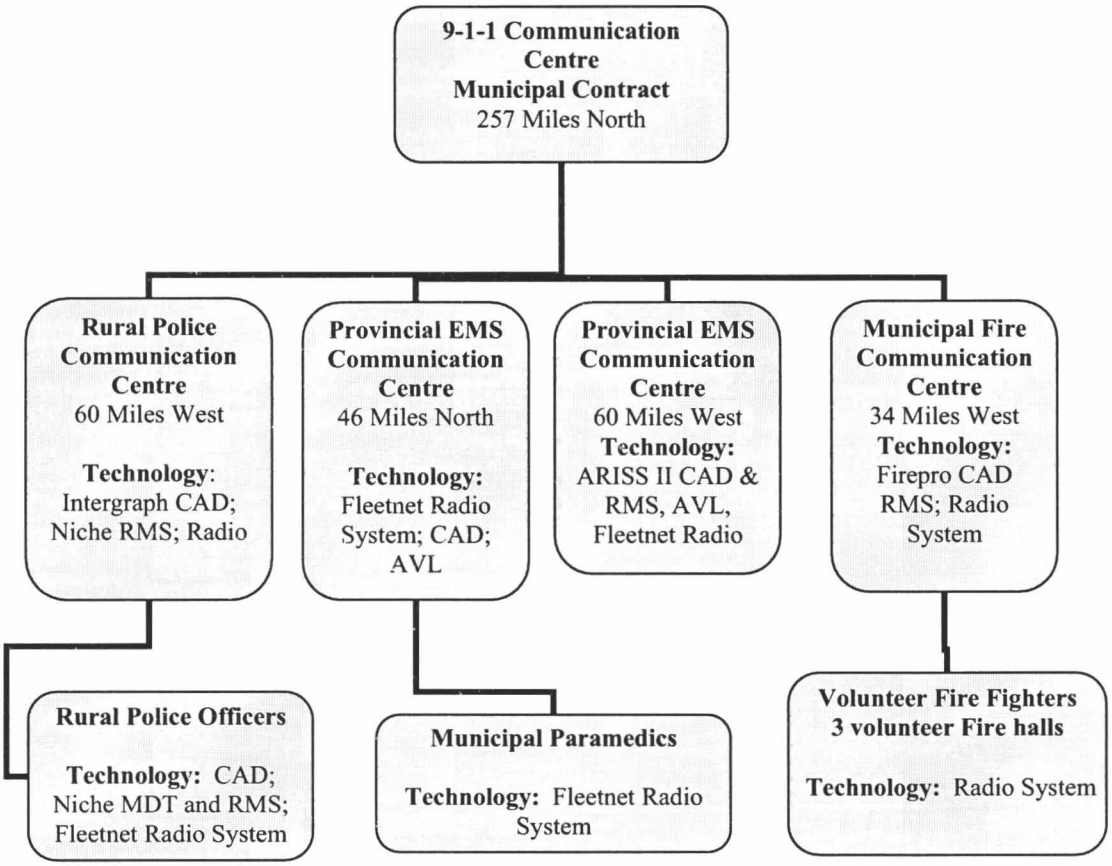
amalgamated, creating a population of just under 13, 000. The municipal amalgamation resulted in the need for an integrated and organized EPS. Shortly after the amalgamation, the municipality signed on with Bell Canada's 9-1-1 emergency system.

Since Bell Canada provides emergency call routing based on ANI/ALI information, a municipality can have its 9-1-1 answer bureau located anywhere within its province. Due to the relatively small size of *Rural* case study's municipality, many of its emergency response communications were contracted out to neighboring cities. This has led to an interesting and multi-player emergency response organization. Figure Three (below) contains a visual map of this EPS organization, illustrating the numerous social worlds and differing governmental involvement of each social world within emergency response. To best understand the *Rural* EPS, I have presented it as an organizational map that outlines how a call is routed from 9-1-1 to the emergency organization call centers (such as police, fire and EMS), and to the frontline emergency workers (police officers, fire fighters, and paramedics).

This *Rural* municipality contracted out its 9-1-1 primary answer service to a city police department located two hundred and fifty seven miles north of the municipality. When someone from the *Rural* municipality calls 9-1-1, his or her number is routed to this contracted police department where a call-taker responds "9-1-1 do you require police, fire or ambulance?". Once the caller responds, the call is automatically routed to the appropriate secondary answer bureau based on the caller's ANI/ALI. Within this *Rural* setting, the 9-1-1 primary answer bureau acts as a call routing service only. 9-1-1 call-takers do not ask for caller or emergency information: instead, the call-taker presses

a button on his or her computer console that directly connects the caller to the appropriate police, fire or ambulance communication centre (Sanders, 2006).

Figure Three: "Rural Case Study" EPS Organizational Map



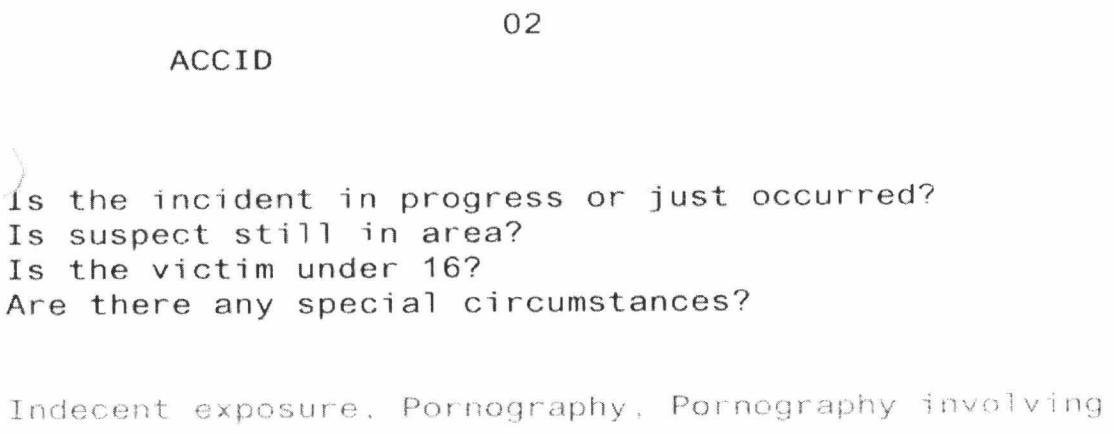
If the caller asks for police, the call is directly routed to the appropriate police communication centre. While the police department and frontline officers are located within the small *Rural* town, the police communication center (i.e. the secondary answer bureau) is located in an *Urban* region sixty miles west of the municipality. Like the 9-1-1 communication center, the police communication center can directly route calls to the

associated fire and EMS communication centers. All police call-takers and dispatchers are civilian positions and don't require a uniform. Since these call-takers and dispatchers are responsible for dispatching officers across great distances, few have seen or had face-to-face interactions with their front-line officers. Furthermore, call-takers and dispatchers are no longer required to participate in police ride-alongs, thus removing personal contact between communication workers and frontline responders.

When a call is received in the police communication centre, it appears on the call-taker's Intergraph Computer Aided Dispatch (CAD) system. The call-taker's CAD terminal displays the caller's name, phone number and address (see Chapter Five for the specific functions of CAD). The CAD also provides the police call-taker with any criminal information associated with the caller, since the CAD maintains a record of previous criminal contact, charges and criminal sentences. The call-taker uses all of this information to assign a classification and prioritization to the emergency call.

In order to classify a police call, the call-taker must categorize the situation. The CAD provides call-takers with a set of scripted questions that are associated with various criminal classifications, such as 'sexual assault', or 'robbery'. Figure Four is an example of the prompting questions provided to a police call-taker when he or she classifies the call as an 'accident'. The prompting questions are used to assess and provide a priority level to the police call.

Figure Four: Police CAD Classification & Prioritization Prompts



A priority level is determined by the "circumstances surrounding the incident" and "not the type of call" (EPS, 2002a). Call-takers must "evaluate all the information being gathered pertaining to an incident and apply their knowledge, experience and common sense in assigning the appropriate priority level" (EPS, 2002a). There are three priority levels for police calls.

A priority one call includes: "actual or potential danger for bodily injury or death. An officer requires immediate assistance. The crime is in progress or imminent. The suspect is at the scene and likely to repeat the offence or flee to avoid apprehension" (EPS, 2002a). All priority one calls must be responded to in the "most expedient manner possible" (EPS, 2002a). A priority two call contains any incidents where the crime is no longer in progress or does not contain witnesses, evidence or life-threatening injuries (EPS, 2002a). The response objective for a priority two call is to have an officer respond within two hours of being dispatched. Finally, a priority three call includes all other offences which do not meet the two criteria above. The objective for a priority three call is for a response to occur within twenty-four hours of receiving the call (EPS, 2002a).

A caller's priority level can be changed by either the call-taker or officer as the situation progresses and more information pertinent to the call is received. Once a call is provided with both a classification and a priority, the call is then dispatched by radio to a frontline officer.

All police dispatch communication within this *Rural* municipality is conducted over a Fleetnet radio system. Every police officer is equipped with a portable radio. The portable radio is operable between officers and dispatchers. They can be connected with the Ministry of Health (EMS), the Ministry of Transportation and the Ministry of Natural Resources, once each agency has logged onto a special interoperable channel. One hundred *Rural* police officer vehicles are also equipped with a Mobile Data Terminal (MDT), which is a portable laptop that is connected into a police officer's vehicle (see Chapter Five for a detailed description of the functions and applications of police MDTs).

For this specific *Rural* police force, the MDTs are only installed in traffic officer vehicles, and enable these officers to perform query checks on license plates and particular individuals. MDTs also enable officers to fill out case reports while in their car. These MDTs are not dispatch oriented, and do not dispatch emergency call information to police officers; instead, they act as a record or report management system. When an officer arrives or leaves a scene, he or she must radio the police dispatcher to report arrival and departure times. Furthermore, when police are on scene and require information on their suspect, or require other emergency assistance such as EMS or fire, they must radio their dispatcher who, in turn, provides the information, or contacts the

appropriate emergency agency. EMS, police and fire communication centres are the hub of emergency communication interoperability (Manning, 1988).

If an emergency caller asks the 9-1-1 call-taker for EMS, the call is then routed to the appropriately zoned EMS communication centre. Similar to the police communication centre, EMS call-takers and dispatchers are civilian positions. Each of the EMS communication centres has eighteen full-time staff , four supervisors, and twelve part-time staff. Like the police call-takers and dispatchers, the EMS communication workers have little contact or face-to-face interaction with their paramedic counterparts. Furthermore, there are no social functions where the various communication centres and frontline paramedics integrate and socialize.

As with 9-1-1 and police calls, all EMS calls are accompanied with the caller's ANI/ALI information. Within this *Rural* municipality, the EMS - unlike the police - has two different levels of organizational control. Dispatch and communication centres for EMS are provincially operated; however, the frontline paramedics are municipally organized, controlled and stationed. Figure Three (above) shows that the municipality has been geographically divided into two distinct dispatch zones, requiring two EMS communication centres. One EMS communication centre is forty-six miles north, while the other is sixty miles west of the *Rural* municipality. Each communication centre is equipped with a CAD system, Fleetnet radio system and automatic vehicle locator system (a geographical positioning system).

The municipality houses its own ambulances, and provides each team of two paramedics with one Fleetnet portable radio and one stationary car radio. Dispatching of

the paramedics is done over the radio. If paramedics require other emergency back-up, such as fire or police assistance, they must radio their dispatchers and then wait for the dispatchers to contact police or fire. When both EMS and police are on-scene, they do all of their communicating face-to-face; however, if they are unable to communicate face-to-face, they radio their dispatcher who, in turn, contacts the police dispatcher to give information (see Chapter Seven for a detailed description of the collaborative work processes involved in a multi-agency incident).

Finally, when a caller asks the 9-1-1 call-taker for fire, the call is automatically downloaded to the fire communication centre. Unlike EMS, which is operated by the provincial government, fire is run by the municipality, while the fire stations are operated by volunteers. The fire communication centre in this *Rural* municipality was contracted to a city located thirty-four miles west of the municipality. In the fire communication centre, there is one fire communication worker who acts as both call-taker and dispatcher. Similar to police and EMS, the fire communications worker is a civilian position.

The communication centre is equipped with a Firepro CAD system and a municipal radio system. When a 9-1-1 call is received at the fire communication centre, it is accompanied by the caller's ANI/ALI information. Once a call is received, the dispatcher sends a page message out to the associated fire department and fire fighters. Each fire fighter has a pager, and when paged, the fire fighter travels to the fire-hall to hear the radio dispatch and gather emergency information. Once on-scene, the fire crew is equipped with eight portable radios and one stationary vehicle radio.

There are three separate volunteer fire departments within the *Rural* municipality, with approximately 20-25 volunteer fire fighters stationed at each fire hall. Each fire department is located within one of the three towns that make up the amalgamated *Rural* municipality. While each station has its own unique identity, all three maintain the same equipment and standardized operating procedures. To ensure that all three stations acquire the same training and equipment, there is one overall district fire chief, who is a full-time employee of the municipality. Within each of the three volunteer stations, there is one chief who reports directly to the district fire chief. The three fire stations have led to three distinct geographical dispatching zones for the entire municipality. These zones do not correspond to the two dispatch zones established by EMS.

If fire fighters have been called to the scene of an incident, and require back-up from another agency, they must radio their dispatcher who, in turn, radios the appropriate back-up agency. All communication is completed through dispatchers and communication centres. Any communication that occurs on-scene is completed face-to-face. If, however, an agency is the first to receive a 9-1-1 call, and arrives on scene to find that it is not the actual agency required, the responders will radio their own dispatcher who will then call and verbally relay the information to the appropriate emergency communication centre. These agencies cannot electronically share ANI/ALI or emergency information.

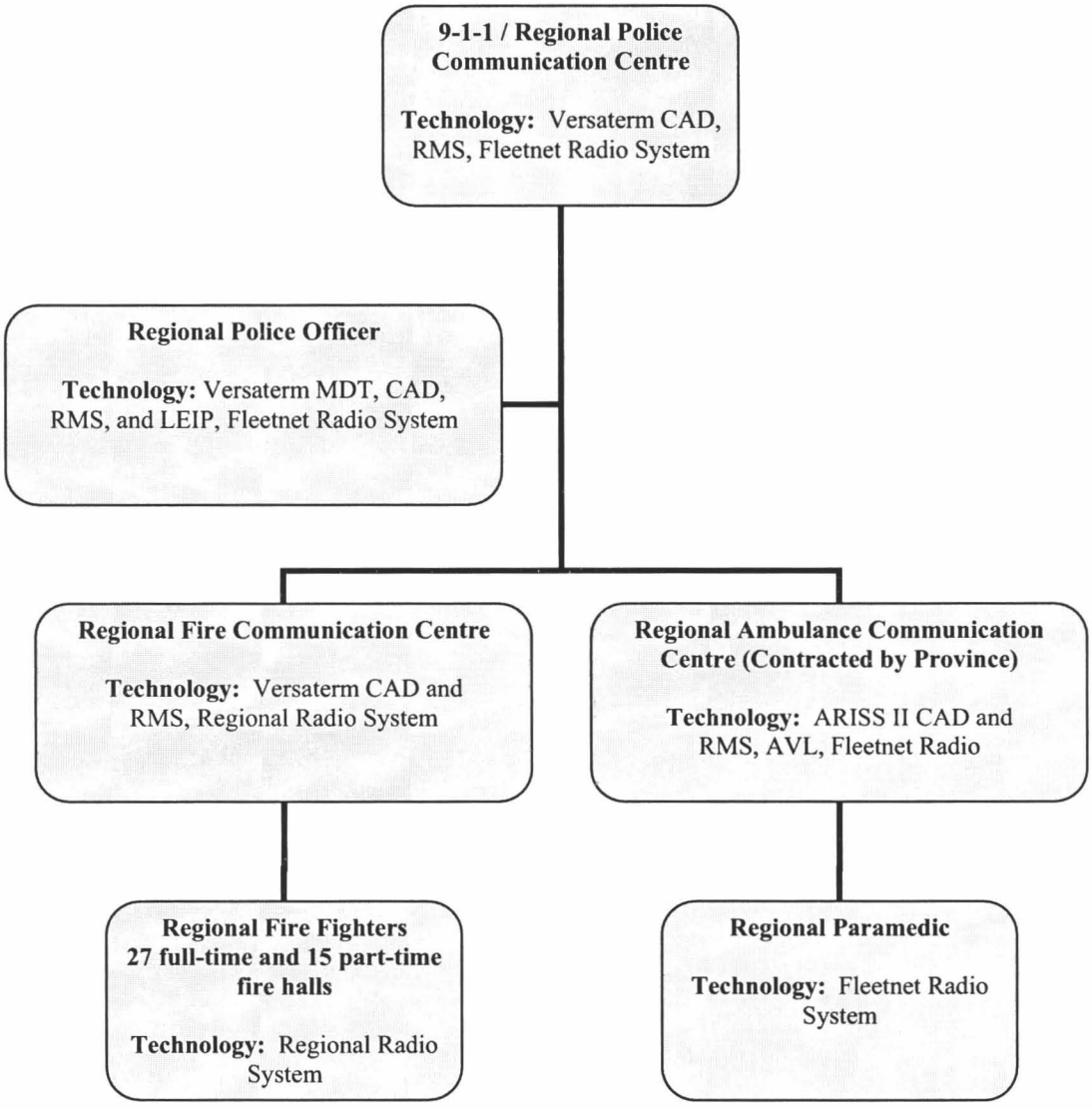
Urban Case Study B: EPS Description

The *Urban* case study was carried out in one of Canada's largest cities with a population of over 1,000,000. Like the *Rural* municipality, this *Urban* municipality has

amalgamated with the city core and its neighboring towns. This amalgamation resulted in the development of a centralized EPS organization (social arena). 9-1-1 came into operation within this city in 1988, and since its implementation, calls have increased by approximately fifty percent: from four hundred and fifty-seven to six hundred and eighty-nine calls per day (Emergency and Protective Services Committee, 2002: 2). While there are similarities between this *Urban* case study and the *Rural* case study, there are also numerous organizational and technological differences. Figure Five contains an outline of the social worlds making up this *Urban* EPS organization. This organizational map outlines how a call is routed from 9-1-1, to the emergency organization call centers (such as police, fire and EMS), and then to the frontline emergency workers (police officers, fire fighters, and paramedics).

Unlike the *Rural* setting, all emergency communication centres and frontline workers are located within the same *Urban* municipality. The 9-1-1 communication centre is also owned and operated by the regional police communication centre. Although 9-1-1 is staffed within the police department communication centre "comprised of police call-taking, dispatching and 9-1-1 operators," only the communication supervisor is a police officer (Emergency and Protective Services Committee, 2002: 1). The call-takers and dispatchers for both 9-1-1 and police are civilian positions that don't require a uniform.

Figure Five: Urban Case Study: EPS Organizational Map



Housing the police communications centre in the police department encourages the development of relationships between officers and communication workers[15]. Many of the call-takers and dispatchers also participate in police ride-alongs. Furthermore, combining the 9-1-1 and police communications into one service, unlike the two distinct communication centres in the *Rural* setting, makes it possible for 9-1-1 call-takers to be moved to police call-taking in times of high caller demand. Therefore, 9-1-1 and police call-takers are the same person "wearing two different hats" (*Interview # 34, 9-1-1 / Police Communication Centre Trainer)*. Both 9-1-1 and police call-takers/ dispatchers operate on a Versaterm CAD, which provides the caller's ANI/ALI information (see Chapter Five for detailed CAD functions).

Once call-takers have collected the appropriate emergency information (which includes the caller's name, address, telephone number and emergency classification), they *electronically* transfer the information to the appropriate dispatcher. If it is a police emergency, the call is electronically dispatched to a frontline officer. Within this municipality, *all* police vehicles are equipped with Versaterm Mobile Data Terminals (MDT). This MDT has connectivity to the 9-1-1 / police Versaterm CAD system, as well as the Records Management System (RMS). Therefore, unlike the *Rural* police MDTs, the *Urban* MDTs are dispatch oriented. Dispatch oriented MDTs provide frontline officers with the information available on the CAD system. Illustration One is a picture of an officer working with his MDT.

[15] In this police communication centre, many of the communication workers were married to field officers.

Illustration 1: Police Mobile Data Terminal (MDT)

MDTs enable officers to personally search and retrieve information without having to contact their dispatcher. Through the use of this technology, officers can receive emergency call information, fill out case reports, and conduct vehicle or person queries from their vehicle (see Chapter Five for further details). Since these MDTs are portable, officers can also take their laptop out of the car and fill out reports from anywhere. Having the MDT connected to the dispatchers' CAD system enables

> single entry, no duplication, entry [of a report]. If a call comes in to 9-1-1 the call gets pre-filled, like the address, name and information, it gets pre-filled from our service and then goes to the dispatcher to see that this is the address. Then when they go to send the call out to the car they are not re-keying any of that information and the officer sees that information out in the car and all that officer has to do is fill in their report. So, single entry and no duplication, because duplication takes time and encourages error (*Interview #29, ICTs Designer*).

Every patrol vehicle within this municipality is equipped with a MDT. Only priority one calls (as described in the *Rural* case study above) are dispatched through both the radio and MDT. The reason for both electronic and voice dispatching is to ensure that officers are aware of priority one calls-for-service. Since MDTs are continually updated with

calls-for-service, a priority one call can be easily ignored as an officer may intend to respond to the call later. Thus, to ensure immediate police attention, priority one calls are accompanied by a radio dispatch, while all other priorities are electronically dispatched to the officer via his or her MDT.

Police officers also carry a portable regional radio, and have a stationary car radio. Police and fire both work on the same regional radio, while EMS operates on the provincial portable radio system. With police and fire working on the same radio, they have access to an interoperable radio channel. This channel allows the frontline emergency workers to communicate together while working on a multi-agency incident. Not unlike the *Rural* EPS, an officer requiring other emergency assistance must radio the dispatcher first, who, in turn, contacts the appropriate secondary emergency agency. For most police officers (within both case studies), the portable radio was perceived as the most important communication tool. One officer explained the convenience and importance of the portable radio for acquiring emergency information or backup:

> If you are away from your terminal and you need to communicate, and that is the real communication piece in my view, so if you are coordinating or responding in any way and you need someone at the backdoor or whatever, or you need paramedics, fire you can contact through the radio…What I mean is if someone else gets introduced into the situation that I didn't know about I can still access that information, I don't have to run down to the car, it is information that I need to do my job and it is available to me (*Interview # 27, Regional Police officer*).

If the 9-1-1 call is an EMS call, the 9-1-1 call-taker automatically routes the call to the EMS communication centre. In this regional case study, unlike other regional EPS organizations, a contract from the provincial government was awarded to maintain

control of the EMS communication centre. Presently, the EMS communication centre is not in the same building as the paramedics, but they plan to be within the same building by the end of 2007. The call-takers, dispatchers and paramedics share training, eating and exercise quarters. The new shared facility and contractual ownership of EMS communications has enabled paramedics and communication workers to become familiar with each other, and to develop relationships together. EMS call-takers and dispatchers are also now required to wear a paramedic uniform while on duty. A number of the communication centre workers noted how the change in dress and new facility has given them a sense of professionalism.

When an EMS call-taker receives a call - and its accompanying ANI/ALI information - he or she radio dispatches the closest paramedic to the scene. Like the *Rural* case study, the EMS communication centre is equipped with an automatic vehicle locator that enables dispatchers to see where all paramedics are stationed throughout the municipality. Each paramedic team is equipped with one portable radio, and a stationary car radio. As is the case with other multi-agency incidents, if EMS requires other emergency agency back-up, it must be routed through the communication dispatchers.

If the 9-1-1 call is a fire emergency, the call is routed to the fire communication centre with its accompanying ANI/ALI information. There are nine call-takers / dispatchers on duty at all times. During a single shift, a person may rotate between being the designated call-taker and the designated dispatcher. While at one time these positions were held by injured fire fighters, they are presently all civilian positions. The communication workers within this *Urban* setting, unlike those within the *Rural* setting,

wear the same uniform as their *Urban* fire fighters. These communication workers also hold social functions with their corresponding fire halls, which have created strong working relationships between fire dispatchers and their frontline fire fighters.

Once a call is received at the communication centre, the fire call-taker dispatches the call to the closest fire hall. There are twenty-seven full-time fire halls, and fifteen part-time fire halls, located within this municipality. As in the *Rural* setting, the *Urban* fire halls all operate with the same equipment, technology and standardized operating procedures. All information for a fire emergency is received over the radio, and reports are completed by fire fighters upon their return to the hall.

Within this *Urban* setting, the fire communication centre operates on the same CAD system as the police:

> The CAD went in 2002 and it was one of those things that were installed, a new CAD system and a new radio system in 2002. It is interoperable with the police. Our tech support comes from the police department, what we basically did was that police already owned the Versaterm CAD and so we ordered the fire package off of Versaterm for the CAD (*Interview #24, Urban Fire Chief*).

This enables police and fire to share a limited amount of caller information, such as the caller's ANI/ALI information. Therefore, if a 9-1-1 call is routed to fire, but is intended for police, the fire dispatcher can electronically route the call to the police call-taker with the ANI/ALI information recorded. This saves a duplication of efforts, by not requiring the fire dispatcher to verbally relay the call to the police dispatcher. However, this technology and information sharing is only available between fire and police. EMS operates on a different CAD system, an ARISSII CAD system, because of strict health privacy laws and regulations.

Synthesizing the Similarities and Differences Between Rural and Urban EPS

From the *Rural* and *Urban* EPS descriptions outlined above, it is apparent that there are many similarities between these social worlds or arenas. While different companies have designed their communication and information technology, each social world has the same technology in place. For example, both police communication centres have CAD systems, RMS systems, MDTs and radio systems. Both emergency response systems also view their communication centres as the hub of the emergency organization, and the place where information gets shared (see Chapter Seven for a discussion of the centrality and importance of emergency communications). It is through the communication centre that one calls for emergency back-up and receives important incident information.

While there are technological similarities between these two case studies, there are also differences. First, in the *Rural* setting different ICTs company designed tools have been incorporated within and across their various emergency agencies. For example, the *Rural* police operate on Integraph CAD, Niche RMS and Niche MDTs, whereas the *Urban* police operate on Versaterm designed ICTs. The significance of this technological difference and integration on the labour and work process of emergency responders is discussed fully in Chapters Six and Seven. For the purposes of this chapter, however, it is important to notice this technological difference.

Second, within the *Rural* setting, there are only one hundred MDTs installed in police cars, and they are only available to traffic police. Furthermore, the MDTs in place in the *Rural* setting are not dispatch oriented. Thus, the information provided on a police

call-taker's CAD is not electronically shared or available to *Rural* officers. Instead, all information pertaining to a call for service is dispatched through the radio. In the *Urban* setting, however, all police vehicles are equipped with a dispatch oriented MDT. All calls-for-service are electronically dispatched to the officer's MDT and priority one calls, those deemed as posing immediate danger, are also dispatched by radio.

Third, both the *Rural* and *Urban* EPS operate on two different radio systems. In the *Rural* setting, police and EMS share the Fleetnet radio, while fire operates on a local municipal radio system. This makes it impossible for all three agencies to attain communication interoperability without one social world giving up their radios for fire to use. In the *Urban* setting, on the other hand, police and fire operate on the regional radio system, while EMS operates on the provincial radio system. Again, this creates disruptions to emergency communication interoperability.

Fourth, within the *Rural* setting, there are no social worlds operating on the same ICTs designed technology. This makes it impossible for the emergency communication centres to *electronically* share caller information between them. The *Urban* EPS, however, has police and fire operating from the same ICTs, Versaterm, and CAD systems. This provides the social worlds of fire and police, within the *Urban* setting, to share as much or as little caller information as deemed necessary by their respective social worlds. Within this *Urban* case study, fire and police share location information only, as all other criminal or personal incident information is protected under privacy laws (see Chapter Seven for specific details).

The main differences between the social worlds are found not only in the technology they employ, but also reside within their social worlds' contexts. From the discussion above, it is apparent that the structure and organization of the various social worlds are not locally centralized in the *Rural* setting. Not only are the communication centres a geographical distance from the *Rural* municipality, but they are also owned and operated by different levels of government. For example, EMS communications are provincially operated, whereas paramedics are regionally controlled. Further, fire is municipally operated, but run by volunteers.

Within the *Urban* setting, on the other hand, there *is* centralization, with all social worlds located within the city, and controlled by the city. Specifically, the city operates 9-1-1, police and fire. It is also the only city within the province to have been awarded a regional contract to have full control of both EMS communications, and the operation of its paramedics. This centralized organization has led to an important social difference between the *Rural* and *Urban* settings. Specifically, the centralized communications within the *Urban* setting has led to more face-to-face interactions between call-takers and their frontline responders. These people worked together, ate together and developed relationships together. Within the *Rural* setting, however, social relationships and face-to-face interaction between call-takers and frontline responders rarely occurred because they did not work within the same municipality.

Many of the frontline emergency responders noted the importance of face-to-face communication for developing trust and familiarity with their emergency counterparts. For example, emergency responders enter most incidents having little information or

knowledge of what dangers they could be facing. They want their call-takers and dispatchers to be aware of and alert to these dangers at all times. The more familiar a frontline responder becomes with his / her communication worker, and vise versa, the more aware each becomes of the other's interactional cues and work needs. As many emergency responders emphasized during their interview,

> "…a lot can be transmitted across a radio just by the intonation of one's voice. There was one time that I pulled a car over and I saw a gun in their backseat. I radioed in to say that I needed backup and the call-taker knew that something was really wrong. She called me at the end of the shift to see if I was okay. She said that I never call for back-up so she knew it was serious. When my fellow officers heard me on the radio they all came over because they knew that I never used the radio unless it was an emergency" (*Interview #07, Rural Police Officer*).

The closer an emergency responder's relationship is with his / her emergency counterparts the more aware each becomes of the personal and intimate traits (such as one's informational needs, work routines, and voice intonations) unique to each individual. For example, the sound of a police officer's, fire fighter's or paramedic's voice can alert the dispatcher that he / she is in trouble and needs back-up. Such intimate familiarity can only be developed through ongoing face-to-face interaction. These relationships were more easily developed and reinforced in the *Urban* setting than in the *Rural* setting because of the organizational layout of their Emergency and Protective Services (EPS).

The importance of face-to-face communications goes beyond merely establishing trust, but is also essential for facilitating emergency interoperability (see Chapter Seven). As I will demonstrate in Chapter Seven, face-to-face communication becomes central for

establishing and maintaining interoperability among police, fire and EMS. The more time emergency responders work together and learn to communicate together, the more able and willing they become to work collaboratively in a multi-agency incident. In Chapters Six and Seven, the significance of these organizational and technological differences on the functioning of emergency technologies is explored.

Conclusion

Having presented a descriptive account of the similarities and differences between the various social worlds within the *Rural* and *Urban* EPS case studies, I now move to a detailed description of the emergency ICTs and their corresponding functions. Chapter Five provides a detailed description of the functions and capabilities of these technologies, as described by the ICTs designers. From this analysis, I argue that emergency response ICTs are discursively constructed as both technologies of knowledge management, and tools of risk management.

Chapter 5: Emergency Response Information and Communication Technology

Introduction

In order to respond to the problem of inadequate emergency interoperability, advanced information and communication technologies (ICTs) have been implemented throughout the social worlds of EPS (specifically, police, fire fighting and Emergency Medical Services [EMS]). The present chapter explores how emergency response information communication technologies (ICTs) are discursively framed by ICTs designers and ICTs personnel.

Specifically, throughout this chapter, I argue that emergency ICTs are framed in two interrelated ways: First as technologies of knowledge management; and second, as tools of risk management. This chapter, therefore, serves two main purposes: First, it acts as a technological roadmap that outlines the various technologies in use in the *Rural* and *Urban* Emergency and Protective Services (EPS). Second, this chapter provides detailed information on how ICTs designers use discourse to establish a need for emergency technologies, and how they conceptualize the functions and the uses of these technologies in emergency response.

As I outlined earlier, ICTs designers are active claims-makers, arguing that the *solution* to inadequate emergency interoperability is the implementation of advanced ICTs within EPS (Altheide, 2006). In order to understand both the social problem and its solution, I have performed a discourse analysis of ICTs designers' constructions of the need for and the intended use and function of emergency response technologies. This

chapter, however, is *not a critique of the effectiveness of these technologies within the workplace*, but instead provides an empirical analysis of the rhetoric and discursive frames used by ICTs designers and personnel (see Chapter Six and Seven for a detailed empirical critique of the effectiveness and use of these technologies by frontline emergency responders).

The present analysis begins with a short description of the discursive frameworks of knowledge management and risk management. Following this discussion are descriptive accounts of police, EMS and fire ICTs, specifically: Computer Aided Dispatch (CAD) systems, Records Management Systems (RMS), Mobile Data Terminals (MDTs), and portable radios. A concluding section summarizes the similarities and differences between emergency technologies within both case studies and provides an analytical examination of the discourses of knowledge and risk management.

Discursive Frameworks: Knowledge Management and Risk Management

The qualitative data for this portion of the study were collected within the social worlds of emergency ICTs design and implementation. The data were collected primarily through ICTs websites and newsletters, training manuals, and formal reports. These texts were supported by five semi-structured interviews with ICTs designers and personnel working within the different ICTs companies and branches of emergency response. In order to maintain a distinction between ICTs designers' constructions and those of emergency responders, only interviews with people in charge of the training and

functioning of emergency ICTs were included in the discourse analysis [16](see Chapter Three for a detailed description of discourse analysis). The principal aim of the discourse analysis was to reveal the rhetoric and discursive frameworks operating within ICTs designers' constructions of the need for and the intended use and function of emergency technologies.

After reading through the designers' talk and texts, two dominant discursive frameworks were identified: knowledge management and risk management. First, designers use a framework of 'knowledge management'. This discursive framework focuses on enhancing work efficiency and productivity by implementing ICTs that provide emergency responders with immediate access to information and knowledge. Second, designers employ a discursive framework of risk management. This framework establishes the salience of crime-related risks and foreseeable / preventable dangers to emergency workers and the general public. Together these frameworks reveal how emergency ICTs designers' legitimize the need for and subsequent importance of their technologies for emergency interoperability.

Knowledge Management

The first discursive framework identified was that of knowledge management[17]. This framework focuses on the need for and the use of ICTs for creating interoperability through knowledge management within and across social worlds. As I have argued

[16] These participants, although working within the various emergency agencies, were geographically separated from frontline emergency workers and only made contact with them in regard to specific ICTs questions. These emergency personnel, therefore, hold a differing construction of the use, function and need for emergency ICTs from their frontline responder counterparts.

[17] The discourse of knowledge management was not an *a priori* concept applied to participants' talk and texts, but instead was identified through the rhetoric and language employed by the participants.

previously, interoperability has varying meanings and definitions throughout the social worlds of emergency response (see Chapter Seven for a detailed description of these varying definitions). Within the present context, interoperability is defined by ICTs designers' as the technological means for sharing information and communication *within* and *between* social worlds. The ability to connect multiple people and social worlds together through technology is the driving force behind knowledge management.

According to academic literature on knowledge management, information and knowledge are considered embedded in people and accessible for organizations to capture, code and transfer to others (Hellstrom & Raman, 2001; National Research Council of Canada, 2000). A discourse of knowledge management contends that the knowledge and experience of individuals within a social world can be extended, once captured and explicated, so that others within that social world can easily find, understand and use it (World Bank, 1998). Information and knowledge, therefore, become regarded as "assets to be managed" (de la Mothe, 2004: 528).

For knowledge management to be successful in any social world, designers argue that information communication technologies are needed. It is through the implementation and use of advanced ICTs, such as Computer Aided Dispatch (CAD) systems, Mobile Data Terminals (MDTs) and Record Management Systems (RMS), that employees become connected with organizational knowledge. Organizational knowledge includes employees' individualized knowledge as well as the procedural knowledge required for workers to accomplish their duties. Procedural knowledge includes a social

world's guidelines and standard operating procedures. These organizational rules, guidelines and standard operating procedures become classified and coded within ICTs.

A discourse of knowledge management, therefore, places ICTs as central for disseminating information and guidance to employees to help them make 'informed decisions' when completing their work tasks (Gottschalk, 2007). As the National Research Council of Canada explains, knowledge management is seen to aid in 'informed decision making' by increasing the collective pool of information and knowledge among all social worlds' members through the utilization of ICTs (2000). Rhetorical focus is placed on the use and function of ICTs for keeping employees connected to information and knowledge, rendering them 'mobile knowledge workers'. Employees become 'mobile knowledge workers' when they are capable of effectively performing their work duties and tasks from any location, both on and off-site.

While significant attention is placed on the ability of organizations to code and classify organizational and procedural knowledge, little attention has been given to defining what constitutes 'information' and 'knowledge,' and more importantly, how one can capture and code an employee's personalized knowledge (Collins, 1990; Shields & Taborsky, 2001). Furthermore, knowledge management discourse assumes a consensual view of organizational control by not questioning how workers' resist the classification and storage of their knowledge and skills (Buroway, 1982).

Significant managerial literature has been published on technology and work that examines the ways in which knowledge among workers is reorganized into technologies (Braverman, 1974; Buroway, 1982, 1985). While many of these studies provide insight

into managerial attempts to capture workers' knowledge and the strategies used by workers to maintain control over their own knowledge, this is not the goal / focus of the present chapter. The present chapter, therefore, does not act as a critique of the effectiveness or the ability of emergency ICTs to capture, code and disseminate emergency responders' knowledge and skills, but instead provides insight into the way ICTs designers conceive of both the need for and the function of their technologies. Further, this analysis focuses on the discourse surrounding ICTs, specifically how workplace efficiency and productivity can be improved by enhancing information and communication interoperability.

Risk Management

A second and interrelated discourse found throughout the text and interviews was that of risk management. Unlike knowledge management, which focuses primarily on the impact of ICTs on work productivity, risk management focuses on the role of ICTs in keeping emergency responders and the general public safe by predicting and preventing future crimes. The discourse of risk management focuses on identifying crime-related risks and rendering them seemingly concrete and calculable (Ericson & Haggerty, 1997).

Risk management also focuses on the 'positive' social goals of surveillance, such as crime prevention and control, while simultaneously down playing the social classification process embedded within information technologies (O'Malley, 1992; O'Malley & Palmer, 1996). For example, emergency ICTs are described as reducing the risks of injury or harm to emergency responders by providing emergency personnel with access to a database on peoples' previous criminal behavior and conduct. Information

pertaining to one's past behavior is coded and stored on police ICTs under the classification fields of "location of interest" and "hazard information". The information stored in these fields contains both criminal and non-criminal references, such as: "prostitute – alias ….has been arrested three times", "verbally abusive to emergency responders", "owns a rifle", "has a vicious dog," etc (*fieldnotes*). Emergency responders acquire access to this information from the moment a person dials 9-1-1 (as it is presented on the 9-1-1 computer console) or after querying a particular street address. This coded information can then be used by emergency responders to guide their interpretations of the scene (and more importantly their construction of the caller's reliability) and their future actions.

Rhetorical focus in risk management, therefore, is placed on the *reduction* of 'foreseeable and calculable' dangers by making information on past behavior and criminal conduct accessible to emergency responders. What is ignored in this discourse is *how* the information actually reduces risks and more importantly, what social implications may arise from coding and classifying information on people and places as harmful and dangerous (see Lyon, 2001, 2003b).

In order to classify, code and calculate 'risks' and 'dangers', technologies used for reducing risk place increased attention on personal details "often in the form of digital data- for the purpose of influencing, managing, or controlling those under scrutiny" (Lyon, 2003a: 15). This discursive framework emphasizes the role of ICTs in surveillance and risk profiling, where information about people and places is categorized and used to determine potential criminals or areas of crime. "The point is to plan,

predict, and prevent by classifying and assessing those profiles as risks" (Lyon, 2003b: 13).

Thus, risk management emphasizes the use of ICTs as tools of surveillance and data-mining. At the heart of this discourse is the desire to bring different ICTs systems together, to combine these technologies and integrate them into one large electronic database that provides mass amounts of classified, categorized and stored data. This discursive framework emphasizes the central importance of data-mining for developing risk profiles and minimizing risk possibilities. "Data mining is a process that has as its goal the transformation of raw data into information that can be utilized as strategic intelligence within the context of an organization's identifiable goals"(Gandy, 2006: 364). Thus the central goal of ICTs, in reference to risk management, is prediction.

Information communication technologies, within risk management discourse, are directed towards identifying behaviors and actions that serve as reliable indicators of future actions. Using past 'dangerous' or 'troublesome' behaviour to 'predict' future behavior, works to conceptually transition risk from the abstract to the seemingly concrete (Parnaby, 2006). A discursive framework of risk management, as described here, works to transform human activities and geographical spaces into pieces of 'pure' information that can be coded and imported into ICTs databases, making them mobile and comparable at later dates for constructing risk profiles (Haggerty & Ericson, 2000). These risk profiles are justified as a means for ensuring the safety of both emergency personnel and the general public.

To conclude this section, my analysis has identified two discourses designers use to justify the need for ICTs and the uses to which they can be put: (1) knowledge management and (2) risk management.

ICTs Designers' Constructions of Police, Fire Fighting and EMS Technologies

Emergency ICTs have ostensively been installed in emergency response to establish and maintain order during emergencies and emergency response. The present section considers the ways in which ICTs designers' construct a need for their technologies, and how they intend them to be used by police, EMS and fire fighting. These ICTs include: Computer Aided Dispatch (CAD) systems, Records Management Systems (RMS), Mobile Data Terminals (MDTs), and portable radio systems[18].

Policing and Emergency ICTs: Examining CAD, RMS and MDT

While the *Rural* police operate on an Intergraph CAD (I/CAD) system, the *Urban* regional police work on a Versaterm designed CAD system. Both CAD systems have been designed by people involved in and working within the police industry. For instance, the Versaterm CAD system was developed by officers working within the RCMP and the project manager for the Canadian Police Information Centre system, which is the national police system. Police CAD systems, therefore, are described as designed by police officers to meet the needs of the police officers who use them. Information provided about police CAD functions or subsequent changes made to

[18] Although there are different companies designing the *Rural* and *Urban* ICTs, their respective functions and applications are the same.

functions are, presumably, a direct result of the comments and desires of the officers who use them. Furthermore, Intergraph and Versaterm CAD systems are developed and used by a wide variety of users and this diverse customer base is described as being essential for creating a broad domain of experience and exposure essential for developing successful emergency communication products (2006).

Both Versaterm and Intergraph CAD systems are described as decision–support programs.

> This "*intelligent*" mapping and data entry system *seamlessly integrates* an *interactive*, real-time map display with call handling, dispatching, records and information management, remote access, and mobile data. I/CAD *enables precise* and exceptionally *fast response*, while conveniently generating a full incident record for downstream use (Intergraph, 2006 *italics added*).

Police CAD systems are described by their designers as producing "*reduced response times*" through the sharing of "real-time information" that is "*timely, accurate and secure*" while simultaneously "*reducing effort*", "*conserving resources*" and "*increasing efficiency*" (Intergraph, 2006 *italics added*). ICTs designers' talk and text constructs the police CAD system as essential for improving work place productivity, thus legitimizing its need and use as a tool of knowledge management.

Both Versaterm and Intergraph's CAD system provide many functions to call-takers and dispatchers, such as plotting routes for police officers to respond to calls in the "*quickest way"* possible (Intergraph, 2006). Both CAD systems are described as being:

> *"Single entry, no duplication"*. If a call comes in to 9-1-1, the call gets pre-filled, like the address, name and information, it gets *pre-filled* from our service and then goes to the dispatcher to see that this is the address. Then, when they go to send the call out to the car, they are not re-keying any of that information and the officer sees that information out in the car and all that officer has to do is fill in their report. So, single entry and no duplication, because duplication takes time and encourages error (*Interview #29, ICTs Designer*).

The CAD also provides a set of scripted questions to guide call-takers when classifying an emergency call. As the call-taker provides responses to the standardized questions, the CAD automatically screens the priority for the call-taker. This discourse places CAD as an acting agent within the emergency classification process, rendering the human actions and decision-making processes informing its construction invisible.

CAD also provides "conversational messaging between CAD workstations, mobile units and even RMS email; all activities are time stamped and logged; [and] extensive location based information (history, hazards/alerts, contacts, premises description information, etc.) that *can be shared with Fire/EMS* services as well" (Versaterm, 2006a). The CAD system:

> Auto-fills the number of the phone call. At that point the call-taker will talk to the complainant to find out the location of the occurrence, the type of occurrence, and input the information in regards to the occurrence. When that information is inputted the I/CAD will generate a location of interest…So when the police go to the residence, they know that "*Okay, we've been here 4 times before in regards to domestic*". The I/CAD system also allows you to add a special situation, which is, say you go and they've got two very vicious dogs, the officers will call in and say "*Can you add a special situation to the I/CAD system*"? Which they will do, the dispatcher will do. And so

> when you go, a location of interest will be generated, and they'll say, "*Be careful, there's two dogs, or the person hates police, bring extra officers*" (*Interview # 22, Rural Police I/CAD specialist*).

Not only does the police CAD provide mapping information, prompting questions and special address information, but it also provides activity reports on the types and number of calls occurring. It is further capable of developing reports on how many calls each call-taker or dispatcher handles and the length of time required to answer a call for service. Furthermore, I/CAD and Versaterm CAD systems are *interoperable with other police data bases* and enable call-takers and police officers to *run a check on a caller's name* in the RMS and Canadian Police Information Centre (Intergraph, 2006).

Niche and Versaterm Record Management System (RMS)

The Police Record Management System (RMS) is described as "'state-of-the-art' police record-keeping systems. A *fully integrated*, versatile *investigative* and *management* tool, [that] improves the *effectiveness* and *efficiency* of police operations" (Niche, 2006 italics added). RMS has access to city and rural addresses, added caution/hazard data entered by police call-takers or officers, unlimited links to incidents, persons, vehicles and property, and access to the Canadian Police Information Centre (Niche, 2006).

The *Rural* police have a separate RMS designed by Niche technology, a private corporation based in Winnipeg, Manitoba, Canada. Niche RMS is fully operational and installed in forty-eight police services across Canada with eight thousand five hundred officers sharing a single database (Niche, 2006). RMS was implemented within this

police department in 2000 and replaced the paper filing process. The *Urban* regional police, on the other hand, operate strictly on Versaterm designed technologies. Versaterm ICTs designers' stress the importance of operating on their specifically designed police technologies for ensuring technological integration and interoperability. For instance, the quote below is not uncommon on Versaterm websites, news releases or news letters.

> At Versaterm…component integration is paramount. Without complete and robust integration, departments can never achieve *effective direct entry and paperless operations*. We typically find that the legacy information systems that most police agencies use have been implemented as independent information 'silos' or stovepipes' — often developed or acquired at different times, from different suppliers, and aimed at addressing the needs of specific units within the department. Versaterm assumes the responsibility to maintain the integration between our products and components. Thus, the CAD, Mobile Data Terminal, RMS… Mobile Report Entry components *function seamlessly*, not only with each other but also with prior and current releases of all other components. That integration eliminates any duplicate data entry … (Versaterm, 2006a *italics added*).

The attention allotted to seamless integration, technological interoperability and paperless operations are all components of knowledge management.

Both the *Rural* and *Urban* RMS functions include: direct *paperless* entry by officers, *single entry*, integrated text editor, image enabled for integrated document and photo images, and email enabled (Versaterm, 2006a italics added). RMS further enables officers the capability to collect, store, retrieve and search data.

> The biggest benefit of RMS is that it is accessible to other police agencies… There are presently fifty-four members as part of the cooperative. This was driven by the need for

> increased *officer safety and interoperability* amongst [police] stations (*Interview # 21, Rural Police RMS Specialist*).

The ability to search and retrieve coded information has led ICTs designers to describe RMS as a tool of intelligence. RMS not only connects officers with coded and classified information, but it also connects them with organizational policies and procedures. For instance, RMS provides standard quality and "*interactive rule checking*" that highlight rule violations in color on the computer screen for officers to see where they forgot information or require further explanation. It provides fast-fill forms for officers to "record routine incident information quickly", and RMS' master filing "eliminates data redundancy: each item of data is recorded in the system only once....Users follow links to relevant data, ensuring that no important details are missed" (Niche, 2006).

RMS is described as the technology where,

> intelligence information is kept because people do move to many different cities around the country and...we actually have a product that moves people around. So what we are interested in on the records side is '*What have you done*'? '*What have you been involved in*?' So that is where we have a product to share information in, amongst Versaterm customers and others. We actually, it is actually open up to any records system that can actually publish to it (*Interview #29, ICTs Designer*).

Again this technology is constructed as a technology of knowledge and risk management. Emphasis is placed on its capacity for technological interoperability, enabling officers to share information across the various social worlds of policing. The information stored on

RMS is described as valuable for data-mining by officers to establish risk profiles on people and places that can then be used to guide actions and resource deployment.

Both Niche and Versaterm provide their clients with access to a master data base. Niche RMS, for example, connects the *Rural* police data base with Niche's other fifty-four client data bases. Versaterm also provides their customers with a shared database, the Law Enforcement Information Portal (LEIP). The Law Enforcement Information Portal (LEIP):

> Enables disciplined information sharing between police agencies, in a region, a province or state or even nationally….agencies "publish" indexable and summary information (on people, places, vehicles, events) to a regional LEIP server (Versaterm, 2006a).

Any police agency using Versaterm RMS automatically publishes to LEIP. Other police agencies not using Versaterm products, such as the *Rural* police, can acquire permission to either upload information or search the LEIP server.

It is estimated that eighteen thousand police officers use or have access to LEIP on a daily basis, and almost one-third of Canada's police information is shared through LEIP (Versaterm, 2006b: 6). LEIP allows indexable criminal and non-criminal information to be shared between departments because:

> The *real intelligence information* is, '*Who were you with when you got charged? What things did you get stopped for that may not be chargeable offenses?*', which is a lot. You can imagine that people who actually get charged with things, what their actual, you know actual criminal activity background is. You know, I mean you know yourself when you get caught speeding how many other times have you perhaps exceeded the speed limit, it is the same thing. So you may actually get stopped and be given a warning and

> that won't show up anywhere, but in a records system that does show up (*Interview #29, ICTs Designer*).

Versaterm and Niche designers' attention to information sharing and RMS interoperability between police agencies demonstrates the interrelated and overlapping nature of knowledge management and risk management discourses. Information stored and accessible on RMS and CAD are expanded through the use of Mobile Data Terminals (MDT).

Niche and Versaterm Mobile Data Terminals (MDTs)

Mobile Data Terminals (MDTs) enable officers to receive CAD and RMS information and write reports while on-scene. This makes the police department capable:

> To operate in a near *paperless environment*, with electronic routing and notification and with near *real-time information access* throughout the department. More than anything else in the system, that instant access to complete and timely information, without paper handling and entry delays, accounts for the *substantial improvements in productivity* that our clients enjoy (Versaterm, 2006a).

Coupling CAD, RMS and MDT together creates,

> A complete enterprise application suite. An enterprise-class system, is defined as a system of systems that spreads across the entire organization, providing measurable benefits and forcing standardization of processes and commonality of information use (Versaterm, 2006).

MDT ensures that data is coded and stored in a standardized fashion to increase and enhance information sharing. MDTs' report system itself is described as being 'user-friendly', requiring officers to point and click for most choices and to fill in additional information where needed (Niche, 2006). While the system is designed for multiple

users with multiple interests, it is the "system availability, integration, and user-friendliness that are primary concerns" for ICTs designers (Niche, 2006).

Both the *Rural* and *Urban* police agencies have MDTs. The *Rural* police have three hundred MDTs installed in patrol officer vehicles, while all *Urban* police vehicles operate on Versaterm's MDT. Both MDTs use:

> The same graphical user interface as desktop workstations. Officers can enter information *where and when it's convenient for them*....Mobile workstations can be plugged into the network, connected via wireless RF, or disconnected and taken to a crime scene (Niche, 2006 italics added).

Not only does MDT provide a means for officers to work from anywhere, but it also enables officers to run checks and queries on people, vehicles and locations. For example,

> Extensive person information can be captured, including demographic information, physical descriptions and cautions, etc. Users can access linked information, including incidents, known associates, next-of-kin and addresses with a mouse-click. Entering detailed person description information has been streamlined by features like choice lists and buttons that make data entry easier. Drop-down lists and interactive checking allow fast and accurate data entry (Niche, 2006).

Business and criminal organizations can also be linked to incidents, people, addresses, vehicles and property. "This allows users to trace gang affiliations and associates, starting from a criminal organization or from a person" (Niche, 2006). The quotes above emphasize the use of MDT for increasing work productivity by making police officers 'mobile knowledge workers'.

Underlying this strong knowledge management discourse is a driving discourse of risk management. For instance, ICTs designers' stress that special address and hazard information is vital for police safety, crime prevention and resource deployment. This special address information is then uploaded into the police geographical information systems to:

> *Identify 'spatial crimes'*, which allows police departments …to *deploy resources efficiently* and to *plan preventative measures*. This information allows officers to check on their computer the number of criminal occurrences in their patrol zone and to then *assess and know how they are going to approach that area.* We use GIS to fight crime (*Interview # 20, Rural Police GIS specialist*).

RMS, MDT and their accompanying information are perceived by ICTs designers and personnel as "tactical tools" for law enforcement, and described as being beneficial and necessary for "solving crime" (*Interview # 20, Rural Police GIS specialist*).

EMS and Emergency ICTs: ARIS-II VisiCAD

Just as the police operate on a CAD and RMS system, so too does EMS. Both EMS communication centres operate on the provincial government installed TriTech's Ambulance Response Information System II (ARIS-II) VisiCAD. ARIS-II has been installed to:

> Take advantage of new related technology. The new system, from TriTech Software Systems from their VisiCAD product line, will be distributed, in contrast to the existing centralized system, whereby each of the designated CADs will have a fully functional system that *feeds data into a central database* on a daily basis (FitzGerald, 2001 italics added).

ARIS-II provides *seamless* dispatching capabilities enabling all information connected with a particular call to be shared instantly between different sites, thus enabling:

> The *closest available* ambulance to respond to an incident, at any time, regardless of the jurisdiction that first receives a call. The centres are able to transfer incidents and units *effectively*, as well as having the ability to *exchange information* and support services with each other" (Clavero, 2006 italics added).

All ambulance dispatch information is sent directly to a central database where the province can conduct *response analysis* to *facilitate resource planning* and *performance enhancement* (Clavero, 2006 italics added). ARIS-II VisiCAD is compatible with the implementation of GPS and automatic vehicle location devices, which enables the call-takers to assign an ambulance to areas requiring coverage or to pick the ambulance closest to a call for service.

ARIS-II also provides call-takers and dispatchers with many functions perceived to increase efficiency and productivity. For instance,

> All the protocols that call-takers use are embedded in the system, it has the different layers and it has all the different things that will happen. The CAD has an algorithm in it with a series of medically directed questions. It provides the algorithm as well as the dispatch priority card index and using those questions the call-takers can *ascertain quickly and effectively* what is the medical problem (*Interview # 11, Rural EMS Communication Supervisor*).

Figure Six is the alphabetical index of the algorithms included within ARISS-II CAD for addressing *all* medical queries Figure Seven provides a specific example of the algorithm and associated questions provided to call-takers for calls concerning allergic reactions. This card is automatically displayed on an EMS call-taker's computer screen

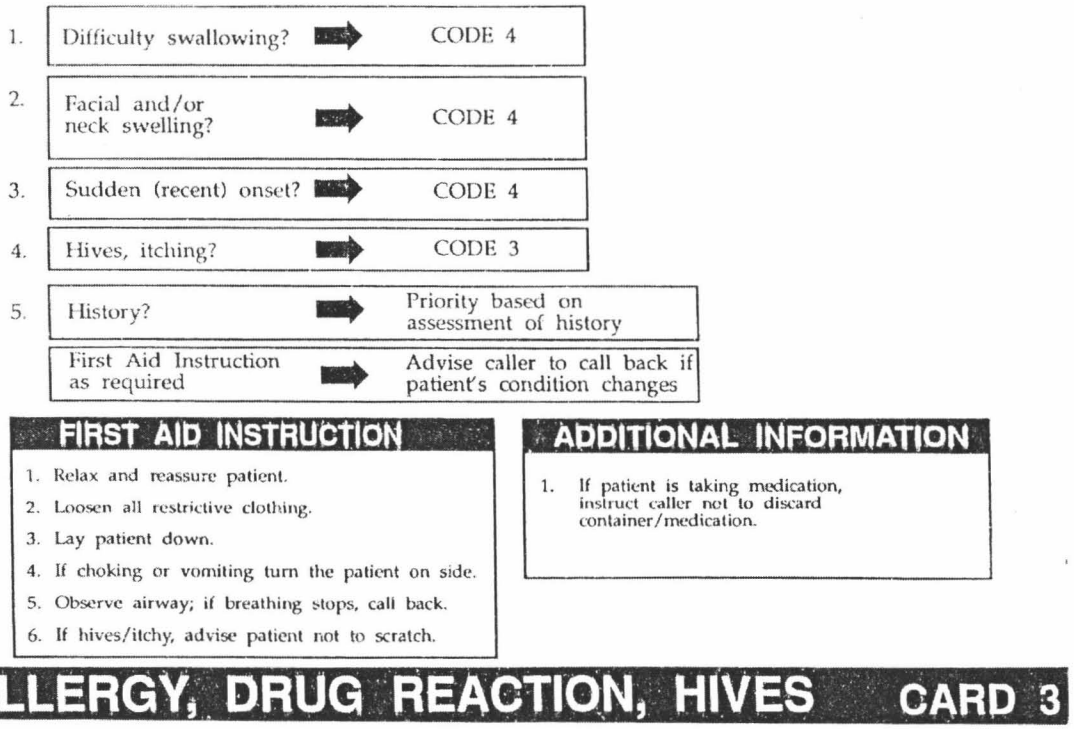
during the classification process of a call. Figure Seven provides the prompting questions that EMS call-takers receive while classifying a call. If the caller responds in a particular way to any or all of the prompted questions, the CAD provides the call-taker with an automatic priority. For instance, if the caller has difficulty swallowing, the call-taker would then give the call a code four priority. Figure Seven also shows the first aid instructions and guidance call-takers receive during an emergency call.

Figure Six: EMS Algorithm Alphabetic Index

ALPHABETIC INDEX

TITLE	CARD	TITLE	CARD
Abdominal Pain/injury	2	Heat Exposure	21
Allergy	3	Hemorrhage	6
Animal Bites	4	Hives	3
Assessment/Primary	1	Hypothermia	22
Back Injury and/or Pain	5	Ingestion/OD/Poisoning	25
Birth	26	Inhalation of Toxic Substances	23
Bites, Animal	4	Insulin Overdose	13
Bleeding	6	Drug Reaction	3
Breathing Problems	7	Miscarriage	26
Burns	8	Motor Vehicle Collision	24
C.V.A./Stroke	28	Neck Injury	5
Chemical Burns	8	Overdose	25
Chest Pain/Heart	11	Poisoning/Ingestion	25
Convulsions	12	Pregnancy	26
Diabetic	13	Primary Assessment	1
Dislocation	19	Psychiatric	16
Drowning	14	Seizure	12
Electrocution	15	Spinal Injury/Pain	5
Emotionally Disturbed	16	Sprain	19
Eye	17	Stabbing	27
Falls	18	Stroke/C.V.A.	28
Fracture	19	Sunstroke	21
Frostbite	22	Thermal Burns	8
Geographical Assistance	30	Toxic Substances	23
Gunshot	27	Unconscious	29
Head Injury	20	Wound	27
Headache	20		
Heart Problem	11		

Figure Seven: EMS Algorithm Card – Allergy, Drug Reaction, Hives



ARIS-II CAD, therefore, acts as a guide for call-takers to make quick and accurate classification and priority assessments. While significant attention is placed on ARIS-II CAD as a technology of knowledge management, there is a second and overlapping discourse of risk management at play. For instance, ARIS-II is described as a tool for creating interoperability between EMS communication centers for the purpose of developing one provincial central data base to be used for future analysis on resource deployment. This data is used to develop risk profiles on the types of calls and medical emergencies for particular areas for the purpose of establishing geographical zones of increased need for ambulance coverage.

Fire Fighting and Emergency ICTs: Examining CAD and RMS

Just as EMS has ARIS-II VisiCAD for storing and sharing information, fire also operates from its own RMS/CAD system. The *Rural* municipality, for instance, operates on the FirePro2 system, which is:

> A *unified* Management System… Developed in Canada for Canadian Departments, FP2 *streamlines* your administrative duties, while providing…the *tools* and *information to make better*, more *timely decisions* throughout your department, from *prevention* and *preparedness* to *operations* and *finance* (Software, 2006 italics added).

When a call is received at the communication centre, FirePro2 provides the call-taker with auto-fill contact information. It also provides drop down boxes for the call-taker to select the appropriate fire classification. Information acquired by the call-taker/dispatcher is inputted directly into FirePro2. FirePro2 operates as both a CAD system and a RMS:

> The reporting capabilities of FirePro 2 are outstanding! They will *save time* and *improve the quality of information* available to your department. Each module in the system will produce built-in *standardized reports* in detailed, summary, and comparative formats in a *fraction of the time* it would take to create them manually (Software, 2006 italics added).

The information and data stored on FirePro2 can be used by the city or municipality to develop monthly activity reports and to assess the types of calls for service being experienced. FirePro2 also maintains staffing records on such things as staff training attendance and payroll.

The *Urban* Versaterm fireCAD system maintains many of the same functions as the *Rural* FirePro2 CAD system. Verstaerm FireCAD is described as providing fire call-takers and dispatchers with:

> Extensive and optionally *shared location information* such as hazard/alerts, contacts, premises details (e.g., construction, inhabitants…).; Extensive map-oriented detail; extended, usually *shared E911 ANI/ALI* call-taking facilities; Uniquely configurable call types with *questions* to adapt the response; can *receive generated calls* from the PoliceCAD and can *also generate calls* to the police dispatcher…; elaborate and *highly configurable response algorithms* by location, by specific building, by call type and by modifier; comprehensive, highly configurable apparatus status screen organized by station and by active incidents; conversational messaging between dispatch staff; [and] all activities *time stamped* (to the second) and logged for later recreation in real time" (Versaterm, 2006a italics added).

Like police and EMS CAD systems, the Versaterm FireCAD is constructed through rhetoric of both knowledge and risk management.

Interoperable Radio System

Both the *Rural* and *Urban* Emergency and Protective Services (EPS) operate on two portable and interoperable radio systems. The *Rural* EMS and police operate from the same government radio system. They also share their radio with other ministries, such as the Ministry of Transportation and the Ministry of Natural Resources. Each social world has its own set of channels with one interoperable channel for major multi-agency emergencies.

While all EMS communication workers and paramedics use the same ICTs designed radio system, the *Rural* police presently work on two different systems that have connectivity with each other. There is a boundary division in the implementation of the new radio system that is used by police. For example, areas further north in the police coverage area, with fewer communication towers, operate from the old radio system. Thus, one of the designing parameters for the *Rural* police was to maintain communication interoperability between the old radio system and the new. As the police ICTs supervisor noted:

> We had to have a means to communicating in the event that we had to bring officers into a new system that was using the previous system (*Interview # 19, Rural Police ICTs supervisor*).

Working from the same system is described as providing the social worlds with *flexibility*. Previously each ministry had its own radio systems but:

> Now we have common talk groups or channels on this radio system where those partner ministries can talk to each other when required (*Interview #19, Rural Police ICTs Supervisor*).

The new radio system is not only described as being flexible but is described as making:

> Information sharing and the coordination of multi-agency incidents much simpler (*Interview #19, Rural Police ICTs supervisor*).

Furthermore, the new radio is described as offering important features to both EMS and police officers. For instance, the new radio, unlike the analog old system, is a digital technology which provides increased communication security because digital technology

makes it difficult for other scanners to pick up. The new system is also accompanied by vehicle repeaters which provide better geographical coverage.

The police ICTs personnel stressed the value of the Fleetnet radio system for increasing officer safety by permitting officers to communicate with each other and their dispatchers at all times:

> Actually another huge difference on the new Fleetnet system compared to our legacy radio system is that our legacy radio system was more of a one-on-one type of communication system. Our new system is much more of a, it is more of a party-line type of system where everybody hears everybody else at the detachment… In policing it is essential that, if we are working in an area we all know what is going on. If I know, for example, that you are going to an occurrence for a residence and that residence isn't in my patrol area, but I know the area and the people, I can get on the radio and say "*You know, you might want to be careful because*"…So I could *share information (Interview #19, Rural Police ICTs supervisor).*

Unlike police and EMS, the *Rural* volunteer fire department operates on the municipality radio system. The fire department's radio system provides each of the three volunteer municipal fire departments with their own radio channel, but during a fire, where more than one department is on-scene, they have *shared channels* for interoperable communication (*Fire Communication Center Supervisor*).

On a similar note, the *Urban* EPS also operates on two different radio systems; one is a regional 800 megahertz radio system that police and fire share, while the other is the provincial radio system used by EMS. The EMS radio enables paramedics to communicate with provincial police and outside ministry partners, such as Ministry of Natural Resources. Both Police and Fire, however, operate on a shared regional

interoperable radio system. The function capabilities of the radio systems in both the *Rural* and *Urban* EPS are the same. If any communication is required between various social world participants, who do not share the same radio, the emergency responder must contact his / her own communication center, which in turn makes contact with the other emergency communication center. Both the *Rural* and *Urban* EPS frame the need for their interoperable and portable radio systems within a discourse of knowledge and risk management. For instance, the radio is emphasized as invaluable for ensuring emergency responder safety and enhancing communication interoperability.

Discussion: The Case of Knowledge & Risk Management

Much of the rhetoric used in ICTs websites and documents focuses primarily on establishing the use of emergency technologies for enhancing interoperability both within and across the social worlds of policing, fire fighting and EMS. Knowledge management discourse describes emergency technologies as essential tools for ensuring policies and procedures are followed, while also enabling workers to perform their duties efficiently and accurately both on and off site. The prominent discourse of knowledge management, therefore, emphasizes ICTs as a solution to the social problem of inadequate emergency interoperability by enabling emergency responders to maintain continual contact with each other while on-scene.

Throughout the analyzed texts and interviews, emergency technologies were described using active terms and verbs, literally rendering them active agents within the emergency process. For instance, designers describe their technologies as *'reducing effort'*, *'conserving resources'* and *'increasing efficiency'*. Using active rhetoric places

increased emphasis and importance on the functions of these technologies, which in turn legitimizes the need for such pieces of technology (Joyce, 2005). ICTs designers further ascribe legitimacy to emergency ICTs by emphasizing how their technologies were developed for or by emergency workers. Emphasizing how the technology is developed by those who are going to use it provides legitimacy to its functions and uses.

Knowledge management stresses the importance of ICTs in providing employees with access to the knowledge and 'know how' to perform their duties from anywhere at anytime. Coded information provided on emergency ICTs becomes accessible throughout an organization for others to use. What is not described within knowledge management literature is *how* this information is to be interpreted and used. I argue that it is through the designers described use of the stored, coded and transferred information that the designers employ a discourse of risk management. I further contend that it is this second overlapping and interrelated risk management discourse that is *driving* the constructed use of and need for these technologies.

Risk management and the use of ICTs for identifying crime related risks and rendering them calculable, coincides and overlaps with the goals of knowledge management. Indeed, risk management "involves the construction and application of knowledge that is derived from contextually specific interpretations of the past, present, and future" (Parnaby, 2006: 8). Emergency ICTs within risk management, for example, function by constructing risk profiles on people and places that can be used to guide actions that minimize risks and prevent crimes. In this sense, police ICTs are constructed to function as tools for proactive policing. The searchable databases stored on CAD,

RMS and MDT store indexable information on people and places that can be used by emergency responders to guide present and future actions (see Chapter Six and Chapter Eight for a detailed discussion of risk profiling and its social implications). For example, 'hazard information' supplied on the police CAD, RMS and MDT can alert officers heading on-scene that at the location of interest is a male who becomes physically abusive towards emergency responders. This additional 'hazard information' can then be used by police officers to guide their actions while on-scene.

Information technologies, within risk management, are no longer just tools of information management, but become transformed into something more. Within the policing ICTs designers' talk and texts, CAD, RMS and MDT move beyond technologies of data storage, to systems that store *intelligence* and act as *investigative tools*. Thus, rhetorical emphasis moves from increasing work efficiency and productivity to a focus on predicting and preventing crime.

These technologies are described as tools necessary for identifying crime-related risks and rendering them concrete and calculable. Through the creation of a central data base within EMS and policing the "information collected in one place and time for the purposes of one…agency…becomes extrasituational and fixed for possible other uses by other…agencies at a different time and place" (Ericson & Shearing, 1986: 152) . ICTs within EPS, I argue, have the potential of leading to "function creep", where the technology designed to function for one purpose, takes on a new life and different function, both within a social world or by a different, and possibly unrelated, social

world[19] (Curry et al., 2004, see Chapter Eight for a detailed discussion on emergency ICTs and the possibility of function creep).

Conclusion

Having presented ICTs designers' constructions of emergency technologies, I now move to an empirical analysis of *how* these technologies work *in-situ.* Analyzing emergency responders' interaction with technology *in-situ* uncovers how there is a critical disconnect between ICTs designers' constructed use and function of emergency technologies, and their use by emergency responders. Thus, in Chapter Six I conduct an empirical analysis of the *negotiated* interaction between emergency responders and their ICTs to uncover how emergency work processes and their associated technologies are defined relative to their local and organizational context.

[19] The social implications of the use of these technologies and the potential for 'function creep' are discussed more fully in Chapter Eight.

Chapter Six: The Intermingling of Emergency Responders and Materiality: The Rise of a Functional Disconnect

Introduction

The previous chapter outlined how ICTs designers, through discourse, construct emergency ICTs as necessary for efficient, effective and interoperable work processes. Throughout Chapter Five, I highlighted how ICTs designers' texts and talk are predominantly grounded within a discourse of knowledge management. This discourse of knowledge management emphasizes the need for and use of these technologies for increasing workplace efficiency, creating mobile knowledge workers, and enabling increased information and communication sharing. I further argued that the overriding and driving discourse embedded within these texts and designer talk was to use information management strategies to enhance risk management. Drawing on over fifty hours of participant observation and interviews within both case studies, the present chapter moves away from ICTs designers' constructions of emergency technologies to empirically examine *how* these technologies work *in-situ.*

Analyzing emergency responders' *in-situ* use of technology uncovers how the constructed need for, and use and functioning of ICTs differs within both settings. As noted already, *Rural* emergency responders conceive of their technologies as leading to a duplication of efforts and increased administrative duties; while *Urban* emergency responders conceive of their technologies as essential tools for enhanced information management for the purposes of risk management. The present chapter, therefore, directs

attention towards a *functional disconnect* between ICTs designers' understandings of the use and function of emergency ICTs, and those held by emergency responders, especially in the *Rural* setting.

Drawing on studies of negotiated orders, social worlds'/ arenas analyses and research in the sociology of science that stress the constructed character of facts and artifacts, I demonstrate that emergency work processes and their associated technologies are defined relative to their local and organizational context (see Bijker, 1989; Strauss, 1993). ICTs, therefore, do not exist independent of their users, designers and interactional contexts (Hughes, 1989, 1999; MacKenzie, 1989). As such, "technological development cannot satisfactorily be treated in isolation from organizational, political and economic factors" (MacKenzie, 1989: 195). In order to understand the technological, one cannot separate its analysis from the social and organizational contexts in which it is utilized (Hess, 1997; Latour, 1991a, 1999b; Law, 1989, 1991c; Pickering, 1995; Star, 1991).

To best illustrate the *functional disconnect* between ICTs designers' constructions of emergency technologies and those of emergency responders, I first define and outline classification systems and their incorporated standards and immutable mobiles[20]. I follow this discussion with a detailed analysis of the impact of *nonhuman actants* and *human heterogeneity* on emergency ICTs functioning within the *Rural* and *Urban*

[20] As defined in Chapter Two immutable mobiles are inscriptions that have the ability to travel unchanged across space and time (Latour, 1987a).

settings[21]. The chapter concludes with a summary of the similarities and differences existing between the *Rural* and *Urban* settings and how these differences lead to varying understandings of the need for and the use and functioning of ICTs within emergency response.

Classifications, Standards and Immutable Mobiles

The history of stored information within emergency response and emergency classifications has changed overtime, in step with changing information technologies and changing organizational needs (Timmermans, Bowker, & Star, 1998). Computer Aided Dispatch (CAD) systems, Record Management Systems (RMS), Mobile Data Terminals (MDTs), and portable radio systems have been installed within Emergency and Protective Services (EPS) as a means to improve information management, information sharing and communication interoperability. These emergency ICTs operate as classification systems, which aim at simplifying the choices emergency workers must make from a wide variety of possible actions. Classification systems organize, and are organized by, work practice (Bowker & Star, 2000). A classification system, in an ideal form, maintains and operates with a consistent and unique classifactory principle, has mutually exclusive categories, and provides complete coverage for the activities it describes (Bowker & Star, 2000).

CAD, RMS and MDTs fit well within the definition of classification systems. Embedded within these classification systems are standards. A standard is "any set of

[21] Nonhuman actants and human heterogeneity were two thematic concepts identified by frontline responders as central for creating technological anomalies that result in differing definitions of the use, need and functioning of emergency ICTs.

agreed-upon rules for the production of (textual or material) objects" that spans more than one social world, maintaining temporal reach, and deployed to "make things work together over distance and heterogeneous metrics" (Bowker & Star, 2000: 13-14). Defining standards in this way highlights their negotiated development and maintenance. Thus standards and classifications, such as those presented on EMS, fire and police CAD systems, are interdependent and involve continual negotiation. "Whatever appears as universal or indeed standard, is the result of negotiations, organizational processes, and conflicts" (Bowker & Star, 2000: 44).

Although the classification systems and standard operating procedures embedded within CAD, RMS and MDT are well-structured within their own social world, they are also flexible and adaptable boundary objects capable of satisfying other social worlds' informational requirements and creating collective and collaborative action (Bowker & Star, 2000b). CAD, RMS and MDTs, therefore, act as *boundary objects;* objects that inhabit several emergency social worlds simultaneously and satisfy the informational requirements of each (Bowker & Star, 2000; Carlile, 2006; Star, 1989; Star & Griesemer, 1989). Chapter Seven provides a detailed description of how emergency ICTs act as boundary objects within the larger social arena of a multi-agency emergency. For present purposes it is important to recognize emergency ICTs as classification systems that act as *objects of cooperation* across the social worlds of police, fire and EMS.

CAD, RMS and MDTs are designed to permit easy storage, retrieval and analysis of emergency data. Illustrations Two and Three show the original *Urban* fire communication centre flip-card algorithm and radio-dispatch console, respectively.

Illustration Two: Urban Fire Communication Centre Flip-Card Algorithm

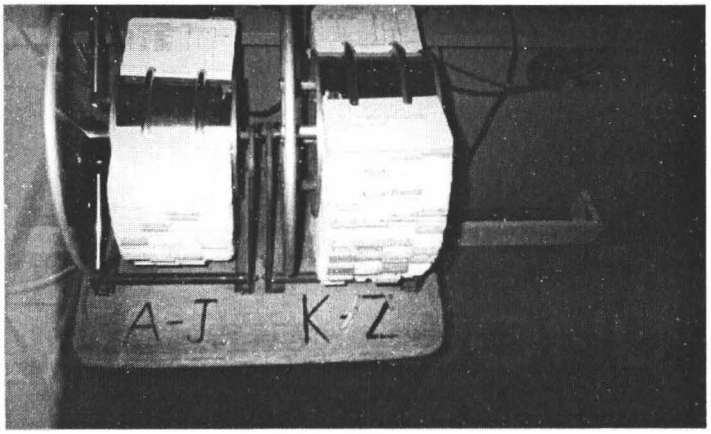
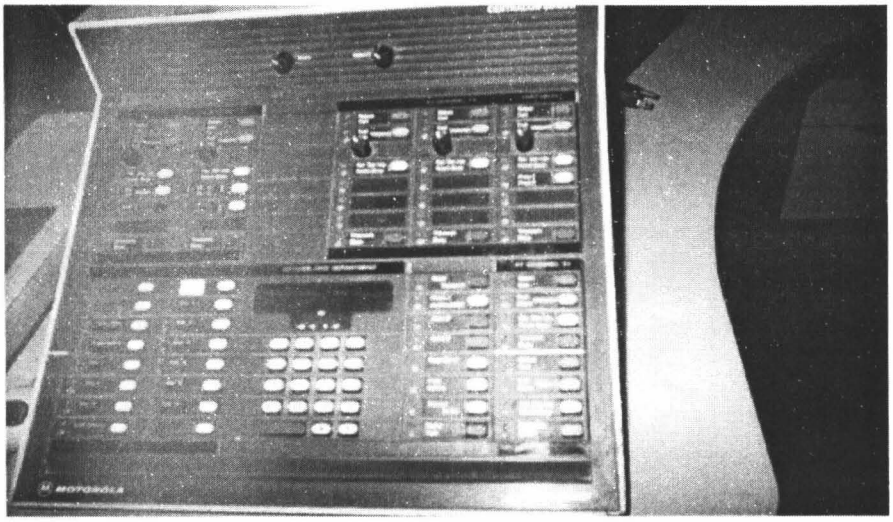


Illustration Three: Original Fire Push Button Radio Dispatch System



These were the only pieces of technology used by fire dispatchers when classifying, prioritizing and dispatching a call for service. Illustration Two displays the flip-card system that incorporated all of the questions and protocols required by fire dispatchers to know and ask when classifying a fire call. This flip-card algorithm did not provide a means for storing the call information, but acted merely as a guideline. Illustration Three shows the original push button dispatch system. This push button radio dispatch system was used to direct calls and dispatch vehicles.

The new Versaterm fire CAD system stores all the standard operating procedures, guidelines and prompting questions provided by the flip-card algorithm above (see Chapter Five for a detailed description of Fire CAD functions). The Versaterm fire CAD, unlike the original flip-card algorithm and push-button dispatch system, acts as a technology of formal representation that attempts "to regularize the movement of information from one context to another" (Bowker & Star, 2000: 290).

Emergency ICTs, such as the fire CAD system, compress time and space, rendering information accessible at anytime from any location (Winthereik, van der Ploeg, & Berg, 2007). For instance, when an EMS call-taker classifies an emergency as 'Myocardial Infarction – Vital Signs Absent' instead of 'indigestion', or as a 'Priority 0' instead of a 'Priority 3', the attached code and emergency response is both organizational and technological. The more people take up and use these classification systems, and their embedded standards and codes, the more natural and durable the objects become. "The more naturalized an object becomes, the more unquestioning the relationship of the community to it; the more invisible the contingent and historical circumstances of its

birth, the more it sinks into the community's routinely forgotten memory" (Bowker & Star, 2000: 299). Thus, classification systems, such as CAD, RMS and MDT, become viewed as powerful and self-sufficient actors or what Latour calls *black boxes* (1987b).

In the preceding chapter, I outlined the knowledge management and risk management discourse used by ICTs designers to describe the use and function of emergency technologies. ICTs designers' talk and texts, I argued, provided agency, legitimacy, and authority to their technologies, while characterizing their classifications and codes as representations of *neutral knowledge*. The designers' describe CAD, RMS and MDT as active members of the emergency classification team, capable of assigning priorities and alerts to responders. Knowledge management discourse, I argue, removes the human labour and subjective decision making involved in the development, maintenance and application of these technologies.

This type of discourse is not uncommon when describing information technologies. For example, Kelly Joyce conducted an interesting ethnographic analysis on the discursive constructions of magnetic resonance imaging (MRI) technologies (2005). From this analysis, Joyce has argued that the cultural narratives used to describe MRI technology have attributed to it a magical power wherein the MRI is seen to speak, reveal and express knowledge. However, the discourse used conceals the work of computer software as it constructs numerical codes and classifications, and the work of humans who have produced and interpreted the MRI images (Joyce, 2005). As Joyce has observed:

> ....images produced by 'high-tech' machines have remarkable status, and operate as signifiers of authoritative

> knowledge....Upon close examination of discursive texts and medical practices, the symbolic positioning of these techno-visual products erases the multiple forces, decisions, and contexts that influence the content and use of medical images. The symbolic positioning further erases how what counts as truth and authoritative knowledge changes across time, disciplinary boundaries, and social contexts (2005: 457).

Like MRI technology, Emergency ICTs have been black boxed as active agents within the emergency classification process, rendering their corresponding codes as authoritative and neutral knowledge.

Emergency ICTs, therefore, are not merely black boxes containing invisible multiple memberships, negotiations and complexities, but they are also *immutable mobiles*, inscriptions that have the ability to travel unchanged across space and time (Latour, 1987b, 1999b). Immutable mobiles are stable networks that have developed out of the mobilization, stabilization and combination of peoples' actions or events from elsewhere (Latour, 1987b).

The restaurant chain McDonalds presents an excellent example of the use and relative success of immutable mobiles. McDonalds is organized on the bases of a network of technologies, skills, texts and brands to ensure that the same products are delivered in the same way, whether one is located in Canada, the United States or Russia (Urry, 2000). The products are produced through a standardized, predictable and calculated process[22]. McDonalds "have produced enormously effective networks based

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[22] Susan Leigh Star examines the impact of networks and immutable mobiles and their relationship to invisible work and problems of identity by analyzing a disruption within McDonalds' standardized work processes (Star, 1991). Through her empirical analysis of asking for a burger with 'no onions', Star illustrates how some technologies become stabilized and work to shape action and inhibit certain kinds of

upon immutable mobiles with few 'failings'" (Urry, 2000). Like McDonalds, the standardized processes and classification systems embedded within CAD, RMS and MDT permit the transfer of codified emergency information across space and time. The information provided on these ICTs permits emergency workers from various social worlds and locations to combine and compare the classified information at any time without it being altered in shape or form.

When ICTs are incorporated within the everyday work processes of emergency responders, the human agency involved in the functioning and application of ICTs can be rendered invisible. Emergency ICTs freeze the inscriptions, knowledge, information, alliances and actions inside themselves, where these multiple members become invisible, transportable and very powerful (Star, 1991). Only by examining the use of these technologies *in-situ* can the multiple memberships and negotiated labour involved in their construction and maintenance become visible.

The best way to uncover the invisible negotiated labour incorporated within the use and functioning of emergency ICTs is when an *anomaly* occurs in emergency work processes. An anomaly is defined as a disruption or interruption of work processes (Star & Gerson, 1986). Anomalies arise when,

> Some person or object from outside the world at hand interrupts the flow of expectations. One reason that glass-box technology or pure transparency is impossible is that anomalies always arise when multiple communities of practice come together, and useful technologies cannot be designed in all communities at once (Bowker & Star, 2000: 311).

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change. This study nicely illustrates how "a stabilized network is only stable for some and that is for those who are members of the community of practice who form/use/maintain it" (Star, 1991: 43).

For example, within emergency call-taking, when a call is received, it is accompanied by a corresponding Automatic Number Identifier (ANI) and Automatic Location Identifier (ALI) through Bell Canada's public emergency reporting system (refer to Chapter Four for a detailed description of emergency call-routing). The caller's ANI/ALI information provides call-takers with the name, phone number and address of the caller. If, however, a call is received at the emergency communication centre from a cellular phone, the caller's information is not always integrated into Bell Canada's public emergency reporting system. Without the associated ANI/ALI information, emergency call-takers are faced with a disruption to their work process as they must now use another means to acquire caller and location identification.

Anomalies, therefore, "point to a critical link between problem structures and work practices" (Star & Gerson, 1986: 163). It is when anomalous situations arise or standards change that the hidden negotiated labour and invisible memberships anchoring these standards in place become visible (Berg, 1997; Bowker & Star, 2000; Winthereik et al., 2007). During participant-observation within the *Rural* and *Urban* settings, emergency responders were faced with technological anomalies because of the integration of nonhuman actants and human heterogeneity. The remainder of this chapter deals with both of these themes and their impact on emergency responders' conceptualizations and uses of emergency technologies.

NonHuman Actants, Human Heterogeneity and the Rise of ICTs Anomalies

Although this chapter is concerned specifically with the disconnects between how emergency technologies were designed to operate, and how they do operate 'on the ground', there were occasions when the ICTs functioned *in situ* as the designers had intended. There were many times, for example, when the RMS and MDTs would allow police officers, specifically *Urban* officers, to file reports and query vehicle license plates while patrolling the streets. There were also incidents when the radio systems would enable frontline responders (fire, police and EMS) to receive and share information with their respective communication workers.

Within both case studies, however, technological disruptions to work processes were experienced because of the presence of outside nonhuman actants and human heterogeneity. Outside nonhuman actants refer to material objects that are not directly involved in emergency response work processes. These objects include such things as weather, trees, ground acreage, buildings, communication towers, water and wind. Human heterogeneity, on the other hand, is a term I use to describe the multiple designers and users of emergency ICTs who hold various, and sometimes contradictory, needs, perspectives, and definitions toward these technologies.

Examining the technological anomalies that arise from the presence of nonhuman actants and human heterogeneity uncovers: (1) the co-constituted social and technological relations involved in the construction of social order within emergency response; and (2) a functional disconnect between ICT designers' constructions of the need for and the use and function of emergency ICTs, and those constructions held by

emergency responders. I now examine the impact of nonhuman actants (most specifically geographical landscape and outside technology) and human heterogeneity (i.e., multiple users and privatization) on *Rural* and *Urban* emergency responders' work processes.

NonHuman Actants and Human Heterogeneity Challenges to Rural EPS

Geographical landscape and human heterogeneity were significant concerns for those working in the *Rural* social worlds of emergency response. Figure One in Chapter Four illustrates the layout of the social worlds within this case study. This figure makes evident the vast amount of land coverage between emergency communication centres and their municipally located frontline responders. As noted, the 9-1-1 communication centre is two hundred and fifty-seven miles north, police communications is sixty miles west, fire communications is thirty-four miles west and the two EMS communications are located forty-six miles north and sixty miles west of the municipality.

The choice of communication centre was not merely an economical choice, decided upon by the best contractual offer between the municipality and communication centre, but was also determined by technological capabilities. For instance, the municipality had to switch their fire and EMS dispatching centres because of the technical requirements of the radio system. Following amalgamation the municipality had to transfer their police and fire communication needs to a different geographic location in order to meet the technological requirements demanded by their new Fleetnet radio system. While at first sight this may appear insignificant, it is upon closer

reflection that the importance of ICTs and their implications for work processes become evident.

Contracting emergency communications outside of the municipality removes local emergency dispatching to a more centralized and distant location with communications workers having little *local* geographical knowledge. Chapter Five, on ICTs designers, argues that CAD and its ANI/ALI and interactive digital mapping functions provide call-takers and dispatchers with enough information and guidance to locate and dispatch emergency calls. Many communication workers, however, found that CAD's standardized street addressing, as provided by Bell Canada, and its corresponding geographical assistance prompts and integrated map do not always provide the 'localized' geographical knowledge required to locate and elicit emergency response. For example:

> I had one call where the gentleman was saying "*I am on* _____ *road and my hay-wagon is on fire*", well where is that road and he kept saying *"Everyone knows where* _____ *road is, it is* _____ *road".* But I said you are calling the city of _____, could you explain? Well then he said *"It is* _____ *road",* and that could be in many of the counties we cover, who knows…See there again, that is where being in that city or from that area helps. So … I would relay that information to that fire department and they would be responsible to know. I know that here we have a road we call *"*_____ *road"* and unless you have lived here long enough, you have no idea what _____road is (*Interview #15, Rural Fire Dispatcher*).

The fire dispatcher quoted above highlights the geographical difficulties that can be encountered within a centralized emergency communication centre.

Emergency CAD systems are described as providing communication workers with formal *standardized* addresses and interactive mapping devices (see Chapter Five). However, the disconnect between the *local and situated* knowledge and the formal *information* that these systems attempt to represent creates anomalies and consequent work tension in emergency response (Bowker & Star, 2000). Specifically, the standardized classifications embedded within emergency ICTs do not provide outside emergency responders with the *local geographical knowledge* and understanding required to elicit response.

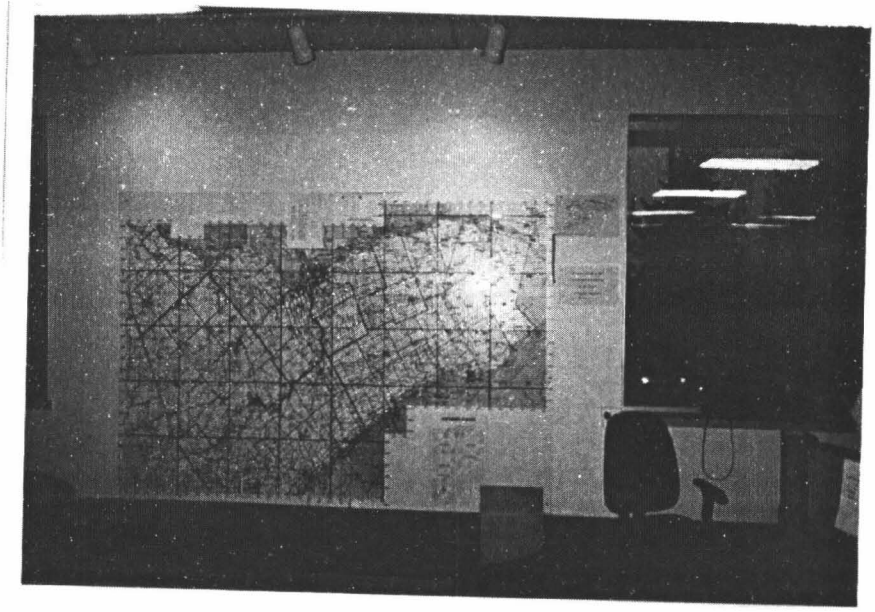
For present purposes, *information* is defined as pieces of 'data' placed within a context. "Information is both locally contextual and relational and we can assign a definitive quantitative and qualitative description to this data" (Shields & Taborsky, 2001: 144). *Information* only becomes *knowledge* when it is translated and integrated with other information into an emergency responder's work processes. *Knowledge* is never static, but is fluid and develops out of action. "This can be summed up by stating that knowledge is a social or collective operation of generalization and the development of normative habits, while information is the property of an isolated context" (Shields & Taborsky, 2001: 145).

In order to remedy the difficulties communication centre workers face when operating emergency ICTs standardized classification systems, specifically the standardized mapping system, the call-takers and dispatchers depend heavily upon the *localized knowledge* of their frontline responders for locating the calls. Some communication centres have attempted to acquire *local* geographical knowledge by other

means. For example, some have created three ringed-binders that sit beside their desk and hold the street aliases and old street names. One of the EMS communication centres, for example, had two of their call-takers spend a day driving up and down a certain stretch of highway to identify the most noticeable landmarks. These call-takers then used this information to create a large bristol board display of the landmarks and their associated standardized 9-1-1 numbers. The man-made 'map' is now used regularly by call-takers to locate emergency callers.

Other communication centres have their office walls covered in large topographical maps that visually outline the different patrol / responding zones. Illustration Four demonstrates the topographical maps found throughout EMS communication centres.

Illustration Four: EMS Wall Topographical Map



The map shown in Illustration Four has been divided (by yellow marker) into different dispatch and coverage zones. It also has small yellow post-its that have dispatchers' hand-written notes on road name changes, old street names, temporary road closures, etc. that dispatchers find useful to have at their fingertips. Surrounding this map are additional notes or important geographical notes as identified by the dispatchers / call-takers and supervisors. Such examples uncover the inability of emergency ICTs to capture and disseminate workers' *knowledge*. Furthermore, the difficulties associated with locating emergency calls highlights the negotiated labour among emergency responders, callers and ICTs for locating and dispatching emergency response.

Not only does a centralized dispatch system create difficulties for locating callers, but it also leads to new forms of digital mapping. Ensuring that the geographical databases remain up-to-date for accurate call-routing creates an increase in administrative duties for Bell Canada. Below is a quote by Bell Canada's 9-1-1 Manager describing the hidden labour involved in mapping emergency response.

> So what they are doing currently for them, when they get a call, they page their people to say "okay it is a fire and it is at blah, blah location", and what they wanted to do was move ahead with that and put in a new radio system and what not, and the current dispatch agency was not able to move ahead with that technology. So they had to go to another location, outside of that county, that was capable of doing that and would work with them. And so what we have to do is take that certain boundary, and everybody that is in it, and send that information to the new agency. So we have to do a lot of behind the scenes work in the data base, that okay if any of the people now call and say they need fire it goes to the correct fire agency" (*Bell Canada 9-1-1 Manager*).

The comments by Bell Canada's 9-1-1 manager shed light on two interesting components of emergency response.

First, he illustrates how technology, through its limitations, becomes an active agent within emergency response, leading to the construction of new geographical boundaries as well as determining which organizations can receive work contracts. Indeed, ICTs and their inherent classification processes both organize and are organized by work practices (Bowker & Star, 2000; Timmermans et al., 1998; Vaughan, 1999). Second, the 9-1-1 manager highlights the multiple layers of human and technological interdependencies incorporated within emergency response. In order for the *Rural* municipality to change communication centres, it must take its residential mapping information and build it into the mapping information embedded within the various emergency communication centres. This detailed mapping information makes evident the hidden labour and information dependency between Bell Canada, 9-1-1, fire, EMS and police for the construction of a centralized dispatch.

The *Rural* municipality has also created a communication boundary within EMS dispatching. This has led to the employment of two different communication centres for dispatching within the same municipality (see Chapter Four for a detailed description). Again this division was described as resulting from technological (in)capabilities. For instance, when the *Rural* municipality amalgamated and joined 9-1-1, the town had poor communication reception. This technological difficulty forced the municipality to contract their EMS communication needs to two different city centres. Below is an

interview excerpt with an EMS communication supervisor concerning this communication division.

> One of the things is, that when these boundaries were done we had a different radio system, and one of the things was the inability of certain areas, communication wise, to contact these areas based on *geographical* formations. So, you have an area that is in a, well [*Rural* case study] is a good example, because we had easier access with our radio communications at that time when they were looked at, we could contact and they could respond to us and they could hear us a lot better than what [the second *Rural* EMS communication centre] could, because of the way of the radio system. With the onset of the [new radio] system that has changed....The original radio system was a piecemeal radio system okay, where we would work on a series of different towers and we had one channel per each area and depending on the *geographical location* again, and it was landline based radio signals, so it was dependent on weather conditions ... as to whether you got good reception or not. And the local, so you would have dead areas throughout the system, because, historically when you have radio signals you have that kind of thing. Depending on the time of year, one of the elements that occurs is because of humidity factors and different weather elements, and so on and so forth, they cause a different signal (*Interview #11, Rural EMS Communications Supervisor*).

The geographical borders for EMS dispatching, therefore, resulted from technological (in)capabilities.

A technologically constructed border within EMS forces paramedics in the *Rural* setting to alter their work processes when responding to calls. For example, during participant observation with paramedics, I saw how they had to remember when to change their radio stations based on their geographical location. In order for paramedics to hear calls-for-service or communicate with their dispatcher, they had to ensure they manually switched radio channels.

> So when [paramedics] come to one area, and there is an overlap, they have to switch [radio channels]. It creates problems because … the dispatchers have to communicate as to which channel or frequency they want all of the ambulances to be switched to, so they can talk. Sometimes they forget to do that and sometimes they forget to switch back. This has been a consistent problem.…(*Interview #18, Rural EMS Ambulance Director*).

The above intermingling and overlapping of material actants and human agency has resulted in a functional disconnect. EMS ICTs, instead of being conceived as improving interoperability, productivity and efficiency, are at times defined as cumbersome, problematic and leading to poor work efficiency.

Not only have technological capabilities led to the creation of organizational work and geographical space, but geographical space has also led to technological anomalies. The EMS communications supervisor quoted above highlights how nonhuman actants, such as weather, radio signals and geographical landscape, can lead to technological disruptions. Although EMS has noticed an improvement with radio connectivity since implementing Fleetnet radio, the aforementioned material actants were also identified by fire and police as problematic to ICTs functioning.

The disruptions posed to emergency ICTs functioning by nonhuman actants were most predominantly noted by the *Rural* police officers. Nonhuman actants, such as geography, weather, batteries, etc., created technological anomalies in *Rural* police radios, Mobile Data Terminals (MDTs) and Records Management Systems (RMS). The following quotes are a representative sample of comments expressed on ICTs technological anomalies.

> **Interviewer:** How is your radio connectivity?
> **Rural Police Officer:** It really depends on terrain, but the rough guarantee is roughly a kilometer. If it is a flat area radio signals, regardless if it is *radio, telephone, satellite*, it is all line of site, so *antenna's* have to see each other, so the more obstructions you have between point A and point B, the more likely you will not be able to communicate, so you have to eliminate those. So areas like [_____city], where it is flat and kind of prairie like, the range is greater, but when you get up into areas like [_____city] area your range is much less because, radio systems don't bend behind hills or go over rough spots…
> **Interviewer:** so there could be dead spots?
> **Rural Police Officer:** absolutely (*Interview #19, Rural Police Officer*).

> Our biggest challenge within the [*Rural*] police perspective is the geography of [our area]. We don't have tower sites or cellular sites in a huge part … because the population mass doesn't support it….Technology, just recently, has been made available to us, but from the [*Rural*] police perspective, where we have many *technologically poor geographical areas*, what we have to look at, is where we can implement this. Our position has historically been that we want to be the same across the [coverage area] and we don't want different service levels … but we are not looking at, if there is an available option and we can only implement specific areas, than we have to look at that (*Interview #19, Rural Police Officer*).

The *Rural* police officers quoted above note the impact that geographical terrain and outside technologies play on the functionality of emergency ICTs.

The ability to both *supply* and *afford* the cost of implementing identical pieces of technologies across the entire coverage area were described as key factors impacting the functioning of ICTs. Supply and cost were also the biggest determinants for what emergency technologies could be implemented in the future. Thus, technological development resulted from organizational, social, economical, and material constraints,

such as funding, location and placement of communication towers, population size to warrant implementation of towers, and geographical coverage (i.e., prairie, hills, water, etc.,).

Since this *Rural* EMS is provincially operated, the emergency ICTs employed were those provincially approved. For instance, EMS went from a privately designed radio system to piggybacking onto a provincial collaborative system designed by a private ICTs company. This radio system was used by a number of social worlds such as the Ministry of Transportation and Ministry of Natural Resources. Below is a quote by a *Rural* police officer in reference to the design and construction of the radio system.

> On our current radio system, the [old radio system] was a [*Rural*] police system that we designed ourselves, with our own infrastructure and our own personnel, and so what we then took was the knowledge we had of our current radio system and then took it to the public sector [private ICTs company] and their partners and told them what our requirements were and worked with them in partnership to design [the new radio system]. And quite frankly, it is a continuous perpetual project, because the reality is, that the *biggest change we have had is trying to educate a private sector partner on what a public safety standard is, versus what they were used to as a commercial level system*. So we have went through some significant growing pains, if I could be completely honest with you. And we continue to make improvements to the radio system, because the biggest difference now is that the infrastructure is all now managed by [a private ICTs company], as opposed to on our [old] radio system where the infrastructure was ours – we owned it all. It was a turn key operation owned by the government…, now the infrastructure is owned and managed by our private sector partners. (*Interview # 19, Rural Police*).

Numerous things are highlighted within the quote above. First, the impact of multiple users on the construction, design and use of technology is identified. For

example, within the *Rural* police department, there are differing conceptions on how the radio should and does operate on the ground. One officer, at the top of the police organization, stated that the radio system functions properly when the car is turned off. A different officer noted that the radio does not function when the car is turned off and when he restarts his car, the radio automatically switches to a different channel. This officer further noted how his dispatcher was unaware of this technological glitch and would continue to radio information when the officer was starting his squad car. Once the officer had restarted his car, he would require the dispatcher to repeat the call information, thus leading to missed information and a duplication of efforts. This example illustrates clearly how multiple users with differing needs and conceptions of technological functions can impact work processes.

Second, the quote above identified the difficulty that can arise when private industries, unfamiliar with emergency response work processes, design emergency ICTs. This second point relates specifically to the difficulty that ICTs designers have for capturing and encoding the *localized* and *situated knowledge* and *work practices* of its users. This problem was not limited to the construction of the radio system, but was also identified when discussing the construction of RMS, MDT and CAD systems. Below is a discussion of the implementation of a Geographical Information System (GIS) within the *Rural* police CAD and RMS system.

> We had an initial orientation, when we first got on, and we needed that exercise to understand how the dispatchers work…. to achieve the same goal… and you have to make sure that the goals that you set for a huge dispatching system to implement, that you have a bunch of people coming together to provide a bunch of information that you

> are tunneled in the right direction of the goal. Having said that, and this is why people make assumptions, because if you, or when you have different people telling you different things about the same matter, *you can get distorted in the way you view how call-takers do their job. I was making assumptions that this should be very easy*, and that is because you hear certain bits and pieces of information saying that this is how the system should work. But, when you actually go to the call-center and see how it is actually run, you see that *I was misled on how the technology is actually used....We make a lot of assumptions at the beginning, that we were making, that we shouldn't have been making*...So, we went through the exercise of sitting down in the dispatch center and go through the process.... And yes, we definitely had a better appreciation of how they do their work and how we need to serve their needs and that was important (*Interview #20, Rural Police Officer*).

The GIS developer above notes the importance of seeing how people use the technology, and designing the programs to fit the users' needs. While the GIS developer works for the *Rural* police, it is not uncommon for different social worlds to hire outside private industries which have little to no direct contact with emergency workers.

Within this municipality, police, fire and EMS operate on various ICTs designed technologies (see Chapter Five). For instance, the *Rural* police, as described in Chapter Three and Five, operate on an Intergraph CAD system and a Niche RMS and MDT. EMS, on the other hand, operates on an ARISS-II VisiCAD and RMS and an Automatic Vehicle Locator (AVL) system. In both social worlds these technologies are not completely compatible. As one police officer noted:

> The problem, I think, that has plagued the *Regional* police and other agencies, from sharing information is that there are so many companies around ... that supply police agencies with RMS and radio systems, that they are not all interoperable. Private companies are also not helpful in

> making these systems integrated, because they are private companies, for their own business (*Interview #25, Police Officer*).

Private companies create three specific problems within emergency response for increasing efficiency and improving information sharing and interoperability.

First, technology not designed specifically for your needs works to configure the user and not vice versa (Berg, 1997; Latour, 1995; Woolgar, 1991). For instance, the *Rural* police belong to a cooperative where they and forty-nine other police departments operate on I/CAD. I/CAD also have a number of other American police departments as clients. When the *Rural* police have problems or concerns with the different technological functions, they must add their concerns to the list of other users' concerns, and then wait to see if their problems are remedied.

> I/CAD has police forces in the States, we belong to a user group, so [Canadian city] is on the same I/CAD system as we are. So it's a few other police forces. So we all meet together and say "*Okay, here are the problems we're having, and here is a possible solution*". And what happens is we put together a proposal and send it off to Intergraph…but there's so many police forces using I/CAD that they take the top whatever and develop in regards to that (*Interview #22, Rural Police*).

This can lead to numerous difficulties as the needs and problems of one social world are reduced to a category within the private companies' list of clients.

The use of private companies, therefore, creates new obstacles for both the functioning and use of emergency technology, as well as for interoperability throughout emergency and protective services. The following quote by a *Rural* police officer summarizes the difficulty created by multiple users of emergency ICTs.

> It definitely makes things more challenging in that, as I said, we define things in this process and protocol in terms of what our expectations are and our deliverables are, and quite frankly, you don't really know what the end product is going to be until it is implemented. Then you have your end users using it and finding cracks in the armour, and then you have to go through a process of protocol to try and correct those cracks in the armour (*Interview # 19, Rural Police*).

When changes are not met, or unwanted functions are added, officers begin to pick and choose what they will use and how they will operate the technology.

As the *Rural* police officer below notes, the process of picking and choosing technological functions can lead to minimal use of the technologies' applications and functions.

> Because it is like anything else, you get used to using certain programs and functions and then 90% of it sits idle, and then you have to go to do something you haven't used for a while and you challenge yourself and think, *"I don't remember how to do that"* (*Interview #19, Rural Police*).

Another difficulty for emergency responders in utilizing the functions of their technologies is the lack of training provided for them. For instance, any changes or upgrades made to I/CAD or RMS are not introduced in-person by trainers, but are received through client based mass-emails. All emergency personnel discussed the difficulties associated with this form of training. Further problems such as: lack of time to fully read the email; difficulty understanding "technological lingo"; and the use of self / peer learning to acquire the knowledge and skill necessary to use the technology have led participants to use only a small percentage of the technologies' functions.

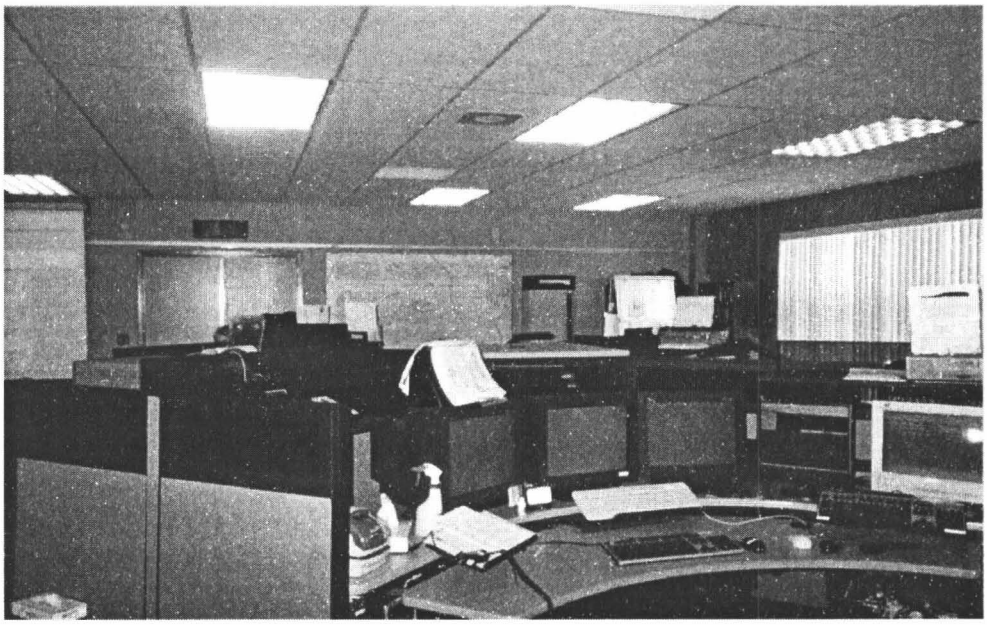
Second, private companies have made licensing agreements that make it difficult to connect with other software operating within emergency response. For example, when an EMS dispatcher is classifying and dispatching a call-for-service, she is forced to work across four or five computer screens and use two different computer mice. As one EMS communication worker notes:

> I think ergonomically there has to be a better way to integrate all these different programs, but that is a problem that has to do with licensing and not with the technology (*Interview #18, Rural EMS Supervisor*).

Illustration Five is a picture of the *Rural* EMS communication centre. This picture nicely demonstrates the problems of integrating various ICTs designed technologies. EMS call-takers and dispatchers have to work on four to five computer screens to classify, prioritize and dispatch a call for service. They also work from two different keyboards and multiple "mice". Illustration Five has three "mice" and three keyboards. The farthest computer monitor to the right, the white computer monitor, is used strictly for Automatic Vehicle Locator (AVL) technology, which is ambulance GPS monitoring.

Third, private industries have created significant problems for information sharing and interoperability both within and across organizations. Only agencies working on the same ICTs designed technology can share information. This creates problems for various police agencies to share and access information. Also, integrating two different private companies within one department, such as the police with Intergraph and Niche, has created problems of interoperability within their own organization.

Illustration Five: EMS Communication Centre Desk



Below is a discussion with a *Rural* police call-taker on interoperability between I/CAD and Niche.

> Now, they're not married together, like we work on I/CAD and I/CAD is compatible to Niche, but it's not – everything doesn't drop in quite right… So the officers on the road do a lot of housecleaning to the events, *which ends up being cumbersome for them*, but the system is so beneficial to us that we're sticking with it (*Interview #10, Rural Communication Centre*).

The quote above identifies the problems associated with integrating two different private companies within one emergency service. The police communication worker further remarked upon the difficulty that *multiple users*, who hold differing constructions of the need for and use of technology, experience in work processes. Specifically, the call-taker noted the value of I/CAD and Niche for call-taking, but also recognized the functional

difficulties for police officers. It is through the administrative labour of frontline officers that CAD and RMS become valuable to communication workers.

Emergency ICTs, Data Entry and 'Idiot Boxes'

Technological anomalies arising from nonhuman actants and human heterogeneity lead to differing definitions of the need for and the use and function of emergency ICTs. For example, during a participant-observation police ride-along, I encountered the numerous problems faced by frontline officers when using their ICTs. During my ride-along, the officer had to re-log onto the MDT six times in order to query information on a license plate and driver she had pulled over. Each time she tried to query or type out her report, she would get logged onto the system and shortly thereafter lose connectivity, requiring her to begin the reporting process again. She explained that this was not an uncommon experience. This officer further commented that her ICTs have increased the amount of paper and administrative work required during a shift. She argues that her job has been transformed from patrolling the streets to administrative data entry. She constantly referred to the MDT and its corresponding RMS as the 'idiot box'.

The *Rural* police officers interviewed and observed throughout the study came to construct the functioning of their ICTs as administrative burdens. One officer argued:

> The technology increases the amount of *administrative work* needed to be filed and removes police presence from the public, where it is needed. For every charge I lay, I have to hand write tickets and then go back and manually type in the report at the office on my own. This creates a *duplicate of efforts*. This technology requires me to do my work in 'triplicate' form….One of the advantages of the technology is that you have a record of things happening and you can find that record easily, but everything is in

> double first: hand written and then typed (*Interview #07, Rural Police*).

These comments were also expressed by other *Rural* officers. Provided below is an interview excerpt on the impact that computerized reporting has had on police work processes.

> So that [RMS and MDT] has tied us here, right now. Me, or us guys here, it's tied us to that computer. So when you used to see [police officers] out on the side of the road, I maybe was writing out an occurrence or something like that on paper, and that got me out on the road, but my information was still only shared within the people at this office. Whereas now I'm off the road when I'm typing the report and it's going provincially or across the country. But you don't see me on the corner when you're walking down the street now. So you don't, you know…Yeah, we're increasing our information across the province, but visibility-wise you say we don't see the police anymore. They're never doing anything. Whereas *we're doing more than what we did before* – it's a perception, it's different. (*Interview #06, Rural Police Officer*).

Both quotes above highlight the administrative impact emergency ICTs have on police work processes when technological anomalies and lack of technological integration are encountered.

While both officers highlighted the benefits of computerized record keeping for search and retrieve purposes, they also noted their decreased public presence. This finding counters many studies completed on policing and ICTs. Previous studies on the impact of MDTs and RMS on policing have highlighted how technologies have increased worker autonomy and proactive policing (Ericson & Haggerty, 1997; Manning, 1992a, 1992c; Meehan, 1998; Palys, Boyanowsky, & Dutton, 1984). It is only by studying

emergency responders and ICTs interactions *in-situ* that the varying definitions and constructions of their impact on work processes become evident.

Not only did the *Rural* police note the increased amount of administrative work created by advanced ICTs, but so too did EMS and fire. For instance, a fire communications dispatcher remarked that:

> At times it is easier, but it is more paperwork again. I don't think, computers make life easier, but they also make more paper and you expect more because you expect all that information to be retrieved instantaneously and it is not retrieved as quick as what people think it is, it has to be inputted properly and unless one person does it all exactly the same, which you are never going to get with multi-users, you can't retrieve that information (*Interview #15, Rural Fire Communication Call-taker*).

As the respondent above notes, ICTs and their inherent classification systems have led to increased administrative work. Furthermore, she identifies the impact of human discrepancies on the functioning of ICTs (Manning, 1992a). *Information*, she argues, is not as easily attained as one might think because there are multiple users with differing methods of operation, conceptions on how information should be stored, and what technological functions should be used. Thus, geographical landscape, outside materiality, privatization and human heterogeneity have led to differing constructions of the need for and the use and functioning of emergency technologies within this *Rural* setting. These technologies do not necessarily lead to mobile knowledge workers or increased efficiency. Rather, they are described as creating a duplication of efforts.

Geographical Landscape and Urban Challenges

Having spent time examining *Rural* emergency response, I will now consider the impact of nonhuman actants and human heterogeneity on *Urban* emergency response. The *Urban* EPS organizational structure and the city's geographical landscape have led to a different type of technological anomaly than those discussed in the previous case study. Figures One and Two in Chapter Four illustrate the organizational and structural differences between both case studies.

Unlike the *Rural* EPS, the *Urban* EPS have all four emergency communication centres (9-1-1, police, fire and EMS) and emergency responders located within the city boundaries. These communication centres are created and developed for the city's specific needs and emergency response requirements (see Chapter Four for specific details). For example, the city built the 9-1-1 / police communication centre within the police headquarters. In 2002, the city moved their five fire dispatch systems, which were spaced across the city, into one centralized location. Following this development, the city was awarded a contract to own and operate the EMS communication centre and ambulance dispatch. Positioning the social worlds of 9-1-1, police, EMS and fire within the city boundary has provided emergency responders with *localized* and *situational knowledge* of the city and its surroundings. Most importantly these emergency social worlds have a much smaller amount of geographical space to cover.

While the organizational differences eliminate many of the geographical challenges faced in the previous *Rural* case study (such as vast land coverage), the city

poses its own limitations. Although flat terrain, hills and tree coverage may not pose as significant a problem, the location of buildings, underground transport, and high rise buildings present a different set of geographical challenges. A dense city population leads to increased housing, public transportation and communication demands by the public. Urban settings are useful for seeing the complex and fluid figurations and mobilities of peoples, objects and information (Curry, 1998; Curry et al., 2004; Mol & Law, 1994; Urry, 2000).

The ability of emergency ICTs to compress space and time, making information and the movement of images mobile and accessible anywhere at anytime, has led to "inner mobility" where people can be both here and there at the same time (Beck, 1999). For such industries as telecommunications and digital media to function effectively, and across geographical space, they remain reliant upon physical networks (antennas, repeaters, fibre optics, etc.) to be in place to sustain public demand (Graham, 2001).

Stephen Graham (2001) provides an interesting discussion of the impact of information technologies on urban space. Graham argues that the information age is not anti-geographical;

> Rather, it encompasses a complex and multifaceted range of restructuring processes that become highly materialized in real places, as efforts are made to equip buildings, institutions and urban spaces with the kinds of premium electronic and physical connectivity necessary to allow them to assert nodal status within the dynamic flows, and changing divisions of labour, of digital capitalism (2001: 405).

For emergency ICTs to function effectively, back-up battery power, data storage and electronic connectivity through the use of fibre optics and visible antennas have to be developed and put in place.

One of the biggest challenges faced by *Urban* emergency responders was maintaining ICTs connectivity while working within different buildings. Below are two quotes, by a firefighter and a police officer respectively, discussing the impact that buildings play on the functionality of emergency technologies.

> One of the things that we have in [the city] are repeater systems, so if the radio isn't strong enough or if you are in a parking garage or a basement, a radio isn't strong enough to hit one of the towers in a city and reach dispatch, you can actually up-to-date a repeater that is in every pump truck. So you go through the pump truck to get a tower. I think these radios are either hit or miss, if you don't hit a tower then you are out of luck. So that is kind of a bonus, *especially downtown* because so many buildings you go into, I don't know there could be two or three floors beneath level, and you just can't communicate if you get down there....There are certain areas that did need repeaters because the signal cannot travel through a building to the other side ...and we have identified those areas and that is when we send certain vehicles in the area that all have repeaters (*Interview #24, Urban Fire Fighter*,).

> Overall our radio system is very good....the time we get dead spots is if you are in the basement or in a tin building, but you are not going to build anything to beat that.... (*Interview #27, Urban Police Officer*).

The quotes above demonstrate how geographical arrangements, such as working underground, can lead to technological anomalies. During an anomaly, the intermingling of human and material agency employed in the stabilization of work processes becomes evident (Star, 1991; Star & Gerson, 1986). The fire fighter's comment above clearly

illustrates the differing work processes required to deal with communication problems. For instance, pieces of outside technology, such as vehicle repeaters, have been installed to improve below-ground emergency communications. These repeaters are placed on the vehicles to help radio frequencies reach the appropriate communication towers. While outside pieces of technology, such as repeater antennas, have helped to improve communication connectivity, the nature of city dwellings and geographical designs can lead to technological anomalies.

Geographical arrangements not only impact radio communications, but they can also create disruptions to the functioning of police MDTs. During my participant observation within a police and EMS call-centre, there were times that CAD, RMS and MDT connectivity went down. When I inquired about this technological disruption, the officer on duty didn't have an exact answer but noted that landscape (such as location of buildings or communication towers), weather (such as severe rain, ice storms or power blackouts), and number of users have been known to impact connectivity.

The power blackout in August 2003 provides an excellent example of the difficulty outside nonhuman actants play on ICTs functionality. Below is an excerpt from this conversation.

> Yeah, the blackout was a nightmare for us, the radio system went down at one point and 9-1-1 went down, so there were people that somehow got forwarded to cell phones, so that was a few moments of a nightmare. Our battery backup in certain areas went down, the radio was going down in certain areas, but eventually we got them back up and running. Uhm, yeah in the communication center, a couple of guys had to go downstairs and get portable radios to give them to our dispatchers upstairs. Because what was happening, was that we didn't expect the power to be out

> that long and battery back up is only for x amount of hours and we had long surpassed that x amount of hours. Plus on top of the blackout it was just chaos….the computers were down pretty soon in. We had power on the computers, but it wouldn't go anywhere, the thing at the station whatever it goes through wasn't working, so we couldn't use our MDT's. *Our MDT's do go down fairly frequently*. It is getting a bit better, but before they would go down once a week …. (*Interview #26, Urban Officer*).

The power blackout, described above, demonstrates how human labour and material actants are intertwined and dependent upon each other. During the blackout, power was lost and to overcome the immediate disruptions to communications new material actants were used, such as cell phones and portable radios. These technologies do not act independent of their users, as previously suggested by ICTs designers, but instead function through the actions and intentionality of the emergency responders (Berg, 1997; Collins, 1990).

While outside technologies, such as cellular phones, can be used at times to repair workplace disruptions, they can also lead to the construction of technological anomalies. Cellular communications have a significant effect on the work processes of emergency responders within a city. While wireless communication devices have posed problems to both *Rural* and *Urban* emergency communication centres, they were perceived as an even greater disruption within the *Urban* EPS. For example, in a large city there is increased use of cellular and satellite communication devices. These devices create two different types of technological anomalies in the work processes of emergency responders.

Below are discussions with a 9-1-1 and a police call-taker on the impact of cellular phones on work processes:

> You cannot believe the problems that cellular phones are creating for us. First of all, the volume of calls coming in has increased drastically due to cellular phones. Two reasons: if there is an accident everyone wants to be a 'Good Samaritan' and call it in; and second, they don't lock their key pad and they are accidentally ringing in. We are just now receiving some ANI/ALI for cell calls, but that is only for a small portion of them. So what we get is, for instance Telus' number and we call Telus and tell them the number we received and Telus will then give us the number of the owner and we can try to call the owner back .... Positioning of towers can also reroute calls from far away and we can't do anything except try to re-trunk it, and that is scary with the batteries and towers to not have the caller disconnected.... (*Interivew #34, Urban Police Call-taker*).

> Most of our calls are coming from cellular phones and they are such a pain, but at the same time I think that they have helped people out of trouble situations. When there are a lot of calls for an accident on the [major highway] or a bar fight, then sometimes our lines *will get blocked* because too many people are calling at once (e.g. bike accident today and 12 cellular calls within 5 minutes)...A lot of time people have no idea where they are and they don't know the street number and we can't know all the stores or post offices throughout [the city]. We always try to give them a major street intersection and work our way from there, all we can go by is street intersections, we must have the street name in order to enter it into the computer system, and otherwise we can't enter anything into the computer system....The cellular towers are no good because they don't help us find the caller, because they don't tell you exactly where they are, and they could be in any house or apartment and there is no way for us to find that information out...Usually people with cell phones, who require assistance, don't get the location out, for example there was a woman who was shouting into the cell phone that her husband was beating her and was going to kill her, but she was disconnected before she got her address out. So we had all this information, but we were unable to

> locate her. A lot of the time you will attempt to do a call back on cellular phones and the person won't answer, or it has been turned off, and it ends up taking a lot of time and this job can't waste time, because for every cell phone that you track and attempt to callback, you are being unable to answer other emergency callers (*Interview #33, 9-1-1 Urban Call-Taker*).

These comments nicely illustrate the hidden and negotiated labour required among call-takers, the caller and emergency ICTs to locate, classify and elicit emergency response.

CAD is described by ICTs designers as providing call-takers with a caller's name and standardized address. CAD has made this standardized address a mandatory first step within the broader emergency classification process. As described by the 9-1-1 call-taker, a call cannot be classified or dispatched without this information. Cellular phones create anomalies in communication workers' work processes because they require the call-taker to work with the caller to identify an address that works in conjunction with CAD's standardized classification processes. The police and 9-1-1 call-taker above, identify two further problems created by outside technology.

First, cellular phones have transformed connections between emergency responders and the public. Wireless communications have enabled people to be nomadic while still remaining 'connected' to the outside world. Increased communications mobility has led to a rise in emergency calls-for-service. Prior to cellular phones, only those immediately involved or in contact with an emergency would call 9-1-1. Cellular phones have now allowed everyone passing the scene of an incident to call 9-1-1. This has led to a new type of emergency caller, the 'Good Samaritan'. Although the 'Good Samaritan' call is helpful, in the city setting it can create significant disruptions to

communication workers. For instance, it can lead to a backlog of phone calls that create work overload for call-takers and dispatchers and it can also lead to an increase in abandoned calls due to high caller volume (EPS, 2004).

Second, cellular phones have introduced yet another private company into EPS. Unlike landline phones, cellular phones are not incorporated within Bell Canada's standardized mapping and Public Emergency Reporting System (PERS). This results in calls being received at 9-1-1 with no caller information (i.e., name, call back number or location). There are two types of wireless 9-1-1 available in Canada. The old wireless version provides emergency workers with the cellular carrier's name, such as Telus, and a generic phone number, but *no caller information*. The new enhanced 9-1-1 (E9-1-1) provides call-takers with a cellular call-back number (including caller's name, home address and phone number, and cellular number), cellular provider, and the communication tower location. The type of information provided to 9-1-1 is solely dependent upon the private cellular provider.

As noted earlier, emergency call-takers cannot classify, prioritize or elicit response to a cellular call without first acquiring location information. Even though some cellular companies have freely provided caller information and tower location, few communication workers find this information valuable. As one respondent noted:

> Knowing the five kilometer range of a cell call is of no help when you think of all the houses and apartment buildings within that area. That really gives us no idea where the emergency is (*Interview #30, 9-1-1 / police Communication Supervisor*).

New standards are being developed to remedy this problem, such as GPS devices in cellular phones. Below is a quote by Bell Canada's 9-1-1 Manager on these new requirements and the impact they will have on emergency response.

> Down the road, we will eventually have cell phones by all service providers that have GPS in them, so satellite tracking will be available for 9-1-1 purposes…It will be there, so when you call in, that data will be available via satellite tracking device, and they will be able to see and pinpoint you to within a meter from where you are….So we can help the emergency services people to a degree…But really, the satellite tracking chips will be the next advance of this thing. And that is, of course, going to be totally contingent on your service provider…but what if the cell phone that you bought and the handset that you have was bought prior to that technology, you don't have that chip in it, so it doesn't do them any good anyway, and you have a million handsets out there already (*Bell Canada 9-1-1 Manager, Interview #13*).

Although CAD systems were designed to have "extended E911 ANI/ALI support including cellular information where available", these functions are not seen by call-takers and dispatchers as operating efficiently or effectively (Versaterm, 2006a). Cellular phones, therefore, create anomalies to emergency responders' work processes because they do not fit within emergency ICT's classification infrastructure.

Although cellular companies do provide the location of the closest tower to the call, this information is not always useful and in some instances it is not accurate. With a city having numerous communication towers, facing different directions, it is not uncommon for cellular calls to be improperly routed, leading to more technological anomalies. Such technological anomalies point to a critical problem of integrating new and dated pieces of technology together.

Cellular phones not only illustrate how pieces of outside technology create technological disruptions, but they also point to the problem of human heterogeneity within emergency response. Cellular phones, like emergency ICTs, are designed and owned by private companies. Emergency services, therefore, have to work across the multiple memberships involved within emergency response.

This *Urban* EPS, unlike its *Rural* counterpart, uses a smaller number of ICTs designed technologies (see Chapter Three and Five for detailed descriptions). For example, Fire and Police both operate on Versaterm designed ICTs, while EMS operates on ARISS-II VisiCAD. EMS, within both case studies, encounters similar problems with information sharing and interoperability because of problems related to integrating private company licenses. Fire and police, on the other hand, face a problem of human heterogeneity leading to 'interpretive flexibility' (Bijker, 1995). Although 9-1-1, police and fire technology is designed by the same company and is fully interoperable, fire and police face difficulties with multiple users holding varying conceptions and definitions of the use and function of these technologies.

"Interpretive flexibility" highlights the various actors involved in the construction, use and maintenance of an artifact or technology and the various, and at times contradictory, meanings and interpretations these actors hold towards the same artifact (Bijker, 1989, 1992, 1995; Latour, 1987b; Latour & Woolgar, 1979; Pinch & Bijker, 1989). Interpretive flexibility is a vital concept for understanding the use and functioning of emergency ICTs as various players within policing, fire fighting and EMS use the same pieces of technology for different purposes.

Versaterm RMS, for example, is used by: 9-1-1 / police call-takers for classifying, prioritizing and dispatching a call-for-service; frontline officers for filling out reports on calls-for-service; officers working in prison lockups for booking the criminal; and lastly, city court officials for filling out court proceedings and results. The following *Urban* police officer summarizes the multiple users of RMS.

> There are a lot of different things that [RMS] does for us. The main patrol officer generates reports, reads other people's reports and can, if they are skilled enough, find out court dates. When I worked in the cellblock, there is a whole custodial part of it that I had to learn to manipulate. Court section has a completely different part of [RMS] that they have access to, so it is compartmentalized. In terms of the maintenance, a guy on the road, unless somebody was from there and showed him or he actually saw and figured it out himself, he wouldn't know how to access the court side. He would have access to maintenance on it, but he wouldn't know how to access it....When I started downstairs I had no idea that RMS is mirrored. There is an occurrence side and a court side, and sitting in the cellblock we start to generate the court side of it, and I had no idea until I was sitting there, that there was that side to it, because I didn't need to, because it wasn't important to me (*Interview #26, Urban Police Officer*).

The information uploaded to the different compartments of RMS is deemed to be relevant and necessary for other users to conduct their work efficiently and effectively.

Versaterm designers, for example, argue that their

> Products have always been distinguished by being *information retrieval oriented*, getting information out as well as putting data in, to *deliver real value from systems*. The products support the capture of data at source, directly by the officers or specialists involved, *resulting in timely and accurate information. The information is entered once, then re-used by all other components* (Versaterm, 2006a).

CAD, RMS and MDT, therefore, are constructed to provide emergency responders with immediate access to information, providing workers with the ability to complete reports with "direct single entry", "integrated text editor", and automatic checks to ensure all required information fields are completed (Versaterm, 2006a).

A problem experienced by emergency responders, however, is *defining what are 'important' and 'necessary' pieces of information* for completing a report. For instance, the work practices and information requirements for these various users differ across the emergency network. What is deemed relevant to a call-taker can be different from that required by a police officer or a court official. While CAD, RMS and MDT are described as providing workers with standardized organizational guidelines to complete reports, there are no guidelines on what constitutes good or bad information (Manning, 1992a).

Although ICTs are designed to provide standardized processes, there are still subjective elements involved in their functioning which can lead to missing or poorly classified information. As one officer explains:

> Every report you submit has to be approved by your sergeant. Like every where else, there are resourcing issues. We are short officers on the frontline, we are short sergeants to actually check the reports....I know when we were trained on the RMS system, we were always told garbage in, garbage out; you put garbage in, you will end up with garbage on the road.... sometimes you just get crap and it is useless. *So you have a record but it doesn't really tell you a lot*.... But, how do you train someone to write a report? It is hard....So *investigatively*, and that is where it really hurts us, is when you go to process a charge in court...that is the human element. (*Interview # 26 Urban Police Officer*).

Problems concerning the 'type' of classified and coded information available arise when there are numerous users with differing needs and informational requirements.

In both the *Rural* and *Urban* settings, emergency responders emphasized how this increasing demand for coded and classified information has led to an increase in administrative duties. A problem experienced in both settings is the lack of standards and guidelines on how much information is to be imputed or what constitutes 'important information' because each person using the system has different agendas and needs. For example,

> There are no automated checks on people filling out RMS reports. There are occurrence minimums however, which are particular information requirements, but *each department has a different perspective or work goal* which then guides officers on what type of information is appropriate and important to link to RMS reports, but this varies by department and agency (*Interview # 26, Urban Police Officer*).

A lot of discursive emphasis by ICTs designers, as illustrated in Chapter Five, is placed on technology leading to 'smart', 'informed' and 'fast' decision making. What is interesting about this discourse, however, is the lack of attention and definition provided for what constitutes 'reliable' information. As Manning argues,

> an interaction exists between information and the social organization of police work. Each functional unit in the police has tacit objectives and resources. Interactions exist between the type of information, the uses to which it is put and the means by which it is processed, stored, and retrieved (1992a: 382).

These tacit differences create anomalies in the functioning of emergency ICTs.

Versaterm has attempted to remedy problems of 'interpretive flexibility' by using emergency personnel feedback as guidelines for changes and technological upgrades. Describing Versaterm technologies within an 'emergency personnel context' provides legitimacy and authority to their products (see Chapter Five). This discourse works to alleviate problems of interpretive flexibility by ensuring that products are developed for the specific needs of emergency personnel.

Numerous *Urban* emergency responders, however, noted the difficulty and inability of Versaterm ICTs to capture their *localized knowledge and work needs*. For example, during a police ride-along, an officer made several comments about his new touch screen MDT and the difficulties he had with it.

> This was supposedly done by us [referring to the MDT touch sensitive computer screen], but I am not too sure where they, different parts of the city have different needs I guess, to say when you are on *Rural* it is a long day, so it is hard to stay awake and I can see why you would be doing messaging and stuff like that because you are sitting out in the middle of nowhere having no one to talk to. Then when you are driving straight roads with no one out walking on it, then you have time to sit and look at the screen, whereas when you are down town and you have people walking all over the place, you find it is hard to do it, because your eyes are often watching what is coming up, like now the only time we get radio dispatched to a call is if it is a priority one. Everything else is done over the computer and even a lot of priority ones don't get our updates on the radio, they come through on the screen…The problem, at least what I find, is that the computer is great if you are not going to a call, but when you are going to a priority call it is very hard to try and touch your screen, you know what I mean. Being steady enough to do it, but more or less you are trying to watch the road, so when you are using the key function everyone knows you keep your thumb here and you can always remember where your keys are if you leave your hand in one spot. But with this [new touch screen

> system] you don't have that option. It was supposed to be simpler, it has got a lot more simpler direct ways to get to certain information, however, that information isn't needed when you are going to a call 99% of the time (*Urban Police Officer, Interview #26*) .

As noted above, the officer makes several arguments *against* ICTs being functional within his local and situational work context.

EMS also commented on technological problems arising from multiple users and 'interpretive flexibility'. The EMS interoperable radio system is constructed to increase emergency responder safety and communication interoperability across the social worlds of emergency response. The radio comes equipped with a 'panic' button that alerts call-takers of any dangers or problems being faced by paramedics. This radio system and its 'panic' button are described as being essential for ensuring worker safety.

EMS personnel, however, argue that the 'panic' button is disruptive to work processes, because it is too easily activated. Many paramedics have had the button accidentally activated while working on a patient. Every time the alarm is activated, the EMS call-takers have to make contact with the paramedic and then contact police services. This has led to an increase in administrative duties that diverts attention away from regular dispatching responsibilities. As one EMS supervisor notes:

> I am not sure if it is going to be fixed before May 2, but our attempt is not to go along until this alarm is fixed, because there is going to be some issues for the health and safety of our staff, because they are just going to become insane from dealing with those alarms. The button is really sensitive, so there is a high potential that it is an accidental activation, but we still have to go through the process. And the procedure is to verify with each crew that is displayed on the console if they are okay, and if they are not

> responding then you have to activate police service
> (*Interview #28, Urban EMS Supervisor*).

Although the 'panic' button was constructed and perceived as a tool to enhance emergency responder safety, EMS personnel find it to be dysfunctional within their work setting.

Incorporating ICTs, designed for multiple users spanning several social worlds, forces organizations to adapt their work processes to technology instead of having the technology adapt to work processes. Thus, ICTs designed for multiple users lead to problems of 'interpretive flexibility', which in turn lead to application problems on the ground. As discussed earlier, the *in-situ* use of the police MDT touch screen and EMS radio 'panic' button point to technological anomalies and a functional disconnect from efficient work processes.

Technological anomalies arising from the *Urban* geographical landscape, nonhuman actants and human heterogeneity demonstrate how technology within a workplace both organizes and is organized by the occupational structure and culture in which the ICTs are used. EMS, fire fighters and police officers within the *Urban* setting noted that ICTs have not only led to an increase in administrative work, but they have also transformed their work processes.

For example, EMS just recently installed ARISS-II VisiCAD, which functions differently from its earlier version. Prior to installing ARISS-II, EMS call-takers and dispatchers had developed a process for receiving and dispatching calls-for-service that ensured the work was equally dispersed throughout the organization. Since installing

ARISS-II CAD, call-takers and dispatchers have experienced an increase in administrative duties that have created disruptions to their standardized work processes.

> The goal of this was to redistribute the workload, because our dispatcher had to deal with thirty-five units, so we needed to split that workload, so we said okay we will do it like air traffic controllers. So the call is dispatched by one person, after they reach scene it goes to the next one…so it was functional up to the time where we received the new CAD. It was workable on ARISS-I, but we noticed all this shifting of the workload and difficulties, but in ARISS-II it became evident that we needed to do something quick. So, I have a working group that has been put together to develop this new process, procedures, and who will do what, and at what point we will switch them (Interview #24, Urban EMS Communication Centre).

ARISS-II, therefore, created new work demands that have led to organizational changes in policies and procedures.

ICTs, Data Storage and Risk Management

While all emergency responders agreed that their ICTs have increased administrative duties, they also recognized and stressed the benefits of having stored information, and most particularly stored hazard information, for risk management tactics. Specifically, prior history and location based information classified in CAD and RMS were perceived by emergency responders as tools of risk management. Police, Fire and EMS, for instance, all emphasized the value of CAD for providing background information on the location of the caller. CAD, unlike RMS, is location-based driven and provides call-takers and dispatchers with previous location-based information. As an ICTs designer explains:

> So on CAD they are very location driven…Our hazards don't just take into account the specific addresses, they take into account radiuses as well. Let's say that they do have the address off, it is across the street or one address over, our radius search will pick it up and will say, *"The house next door has a violent gang member who is known to hate police"*, because perhaps you have the address wrong. Also perhaps you will pull up to a lost bike to the house next door and the bad guy with the gun will think, *"Oh, oh they are here for me"* and will go out blazing. So it is important for the hazard information to be geographic centric and also to take into consideration a little buffer around the outside (*Interview #29, ICTs Designer*).

Notably, the description above employs a risk management discourse as the stored hazard information is described as vital to officer safety. Both EMS and fire fighters embraced this risk management discourse and identified the stored location-based information as the most useful function on CAD. For example, when a call is received in either police or EMS, any previous contact information that was deemed 'hazardous', such as previous arrests, verbal abuse to emergency responders, or vicious dog, was used to alter the type of response. In these situations the police were dispatched first and EMS and fire would wait one or two blocks away for police arrival.

Emergency workers argued that the ability of RMS, CAD and MDTs to make previous emergency contact information accessible was valuable for altering organizational protocols and work practices to ensure public and emergency responder safety. In this sense, *Urban* emergency responders more closely embraced their respective ICTs designers underlying constructions of the need for and the use and function of emergency technologies.

While the location-based information was deemed valuable, many emergency responders noted the difficulty of keeping this information up-to-date. The stored hazard information does not move with the person, but is instead connected to the geographical location. It is only changed when an emergency responder recognizes the information as inaccurate and manually up-dates the system. This can lead to missed or inaccurate information for emergency personnel arriving on scene. Maintaining current, up-to-date records, therefore, proves essential for the safety and security of emergency responders and the general public alike.

Unlike CAD, RMS stores coded information that is person-centred. MDTs have enabled *Urban* officers' immediate access to CAD and RMS, making officers less reliant on dispatchers for screening, prioritizing and relaying caller information (Manning, 1977, 1992b, 1992c; Meehan, 1998). For example, during my police ride-along, the *Urban* officer was constantly querying vehicle license plates and peoples' names within the system. Below is an excerpt from my ride-along

> **Officer**: this is one nice thing about the MDT, or at least whenever I do a stop (speaking now of stopping at a stop light, not necessarily during a police traffic stop) I just run the plate and it gives me all the information about the person. (As he runs the plate information the computer makes beeping noises that are very identifiable in the car. This beeping noise is made every time a new entry has been made to the CAD or a priority call has been dispatched out to alert all officers on the road). "*That's funny, look at that car ahead of us. It has a MADD sticker in the window and yet the driver has had two previous DUI's (driving under the influence)*".
> **Interviewer**: I was noticing that you were doing that and realized that anyone could run my plate while I was driving
> **Officer**: Yeah, this is where we get a lot of our pull-overs. (*Interview #26, Urban Officer Ride along*).

Not only did the officer use his MDT to run license plates, but he would also use it to run different names through the system. For example, during our ride-along, we were patrolling the busiest part of the city and also the area that housed many of the cities' homeless population. Below are excerpts from my field notes on two memorable exchanges between a patrol officer and a perceived 'troublesome' member of the city.

> When we approached a large group of homeless people, the officer pulled the car over and began to question one of the female pedestrians. As he questioned her, he queried her name into the system and began asking if she had 'showed up in court' that day. She then yelled at him for stopping her for no reason and that she was just returning from court "*Where you's people sent me for trying to get into my own f@**!!! house. May I return to walking on the street and bothering no one!*". As she is yelling, the officer asks her to stay and he continues to query information on her and what criminal activity she has had in a while. He then asks her where she is staying for the night and why she had to go to court. Once he has read through the information provided on RMS, he drives on.
>
> Moments later we pull over a driver, who is driving with a three year expired license-plate sticker. When the officer approaches the car, the driver becomes visibly irritated by the officer. The officer returns to the car and swipes the drivers' license through his MDT. While the officer waits for the information to pop-up on the screen, he begins to fill out a report and a ticket for the expired license plate. When the MDT has searched RMS, it produces a report that is accompanied by the driver's license picture. This ensures that the driver is the owner of the vehicle and is also the same person we have pulled over. While MDT continues to search RMS, CAD and its associated Canadian Police Information Centre (CPIC) database for past criminal charges, the officer returns to the driver. This time the driver becomes verbally abusive and says that it is not his vehicle and he is running very late. The officer returns to the car and sees that RMS has pulled up previous police contact information. The MDT shows that the driver

> has been pulled over three previous times for his expired sticker. It also notes that he was verbally abusive and that he was charged previously for assault and later for impersonating a police officer. After reading this information, the officer then pulls out two thick handbooks, one stating all codes and criminal charges and the other providing the definitions associated with the various codes and charges. The officer searches through the different charges to see what definitions fit best with the present situation. The officer then chooses five different offenses, resulting in a charge exceeding $500 and an accompanying court date (field-notes).

Notably, the five charges were subjectively constructed by the officer and were grounded in the driver's present actions and demeanor as well as his past criminal behavior.

From the ride-along examples above, the use of CAD, RMS and MDT have transformed public patrolling and the processing of criminal charges, and rooted them in past and present actions. These technologies have also transformed police work processes from tracking crime to tracking the perceived 'criminal'. The examples above also indicate how these technologies can be used to not only ensure officer safety, but to also work as tools for disciplining bodies and spaces (Foucault, 1977). These technologies store coded information that has created new and technologically mediated forms of social sorting (Ericson, 1982; Ericson & Haggerty, 1997; Lyon, 2003b, 2002).

The following statement from an *Urban* police officer demonstrates how the implementation and use of emergency ICTs can work to discipline, and in the present example marginalize, space, place and identities:

> Often times where you get down in the [city core] and the downtown sectors you will ***look at the poor people, or bums***, what have you, and you will see that they have a couple of warrants here, so they will move down to [a different city] and when they move to [that city] they have

> absolutely no history, but now [because of the Law Enforcement Information Portal] we get their history. Because you know, they do a circuit, they go [one city], [second city] and head out West for a couple of years, so now ***we can actually track them***, where these people last were, which is nice. (*Interview #26, Urban Police Officer, emphasis added)*

As the officer notes, emergency technologies, especially those capable of crossing geographical landscapes, have transformed work processes. While space restrictions preclude an in-depth analysis of the use of emergency ICTs for disciplining and marginalizing space, Chapter Eight will provide a detailed discussion of the social implications surrounding the use of emergency ICTs.

CAD, RMS and MDT are discursively constructed by their designers as tools providing emergency personnel with 'authoritative' and 'objective' knowledge that leads to 'informed' decision making. However, analyzing the *in-situ* use of these technologies uncovers how they reinforce the use of social categories (such as race, occupation, etc.) by emergency personnel for constructing and defining deviance, and for eliciting emergency response classifications.

These technologies have not only transformed emergency responders' work with the general public, but they have also transformed organizational work processes. The following quote by an *Urban* Police Officer identifies how the use of emergency ICTs can impact organizational work processes.

> We are, our department is *very driven by crime analysis*, that is very up on our priority list. It is part of our, not of our values, well *yeah it is part of our values. Our mission statement is crime analysis and allocation of resources through RMS is part of our values.* What we do is we use the district model and district response model. So this

> would be a district and in this district you would basically have two levels of response and you would have a patrol response that they respond and do *target policing* and response to emergency calls. Then you have district response, which is based on a neighbourhood and within that neighborhood knowing your area and knowing *who the players are* in your area and then problem solving in that area. So in the district response they have an analyst that is attached to that particular district and that analyst basically *takes all the crime and they will determine that based on all of this crime 'Break & Enters (B&E's)' are a big priority*, so they will talk to the district sergeant and say 'you have a B&E problem'. That sergeant will ask for a study on the past months B & E activity to see *where the problem is,* and *it will be broken down to two blocks in that area between certain hours and what is nearby* so the officers will be dispatched out during that time and to those blocks and *they will actually target and come up with a plan to target* that area to stop crime (*Interview #25, Urban Police Officer, emphasis added)*!

The officer cited above draws attention to the role that emergency ICTs play in transforming past behaviors into the predictors of *present* and *future* actions. Conducting crime analysis on the information stored in police ICTs has worked to: (1) transform the police agencies work processes (as the police department changes its allocation of resources to fit the 'predicted' crimes); and, (2) transform 'neutral' geographical space into 'criminal zones' and 'hot beds of Break and Enters'.

Not only can the use of emergency ICTs lead to organizational changes, but they can also alter emergency responders' organizational responsibilities and relationships with fellow colleagues. As the following Urban Officer explains,

> [The MDT] gives me all of the information on the computer here that you get up in the communication center, plus a bit more because I get all the in-house stuff. They get it there, but they don't have the time to check through it all the time and often times there is something specific that

> I am looking for, and they don't know exactly what I am looking for (*Interview #27, Urban Officer*).

The information accessible through police MDTs have impacted work processes, as they remove officers' dependence on their call-takers for sharing information (Meehan, 1998).

Emergency ICTs, therefore, are embraced by *Urban* emergency responders as tools of risk management but not necessarily for knowledge management. As noted, many of the emergency responders mentioned the difficulty of using these technologies to *capture the localized and tacit knowledge* required to complete their job. For example, the officer below notes that the *information* provided on CAD, RMS and MDT is valuable, but only when placed within an interactional and occupational work context.

> I wouldn't do data mining to find crime areas when on the road because it takes up too much time. You can't have all that information at one time because you can't use it all. It takes skill and time, but eventually one learns what information is necessary to have for a call and one can quickly scan RMS to find necessary information…Officers need to learn to prioritize, because you do a traffic stop and the guy who you stopped was stopped in 1986 with a known drug dealer. Some officers would use that to add to what they are doing when there is no more contacts. Well, that is a problem because you know what, he was with a person so many years ago, it could be seen as a problem. You have to be able to sort and prioritize what is important and what is not and you have to read really quickly, or you should be able to read really quickly. No, I think it is helpful. (*Interview # 26 Urban Police Officer*).

The *Urban* officer makes two important points about the potential functioning and actual *in-situ* application of emergency ICTs.

First, the officer highlights how the *information provided on RMS, CAD and MDT is only valuable when placed within context.* Information about a 1986 pull-over is not as

relevant when it is not accompanied by any recent criminal activities. ICTs, therefore, provide emergency personnel with abstract, contextless, coded information. It is only through the local, subjective and interactional processes of emergency responders that previous incident information becomes useful.

Second, the officer notes how emergency technologies are primarily used and perceived by emergency responders as tools of risk management. Emergency ICTs within this *Urban* setting, therefore, are largely used to establish the salience of health, fire and criminal risks, rather than as tools strictly for increasing efficiency or emergency interoperability.

Conclusion

Emergency ICTs have been implemented to: (1) create standardized and objective processes for classifying and prioritizing emergency response; (2) increase work efficiency; and, (3) improve information and communication interoperability throughout Emergency and Protective Services (EPS). CAD, RMS and MDT act as classification systems capable of compressing both space and time by rendering information standardized and accessible from anywhere at anytime. The growing dependence on and use of emergency ICTs has led them to be perceived as black boxes, capable of operating as authoritative and objective actors within emergency response.

Black boxing emergency ICTs renders the human labour and, more importantly, the subjective interpretations grounded within ICTs operations, invisible. However, by conducting an *in-situ* analysis of emergency responders' work processes I have illustrated the socially constructed and negotiated development and use of emergency ICTs.

Furthermore, analyzing the *in-situ* interactions of emergency responders and their technologies uncovers a serious *functional disconnect* between the design of emergency ICTs, and the local and situational application of these technologies by emergency responders.

Specifically, comparing two organizationally distinct Emergency and Protective Services (EPS) draws attention to a unique challenge, created by the presence of nonhuman actants and human heterogeneity, to the efficient functioning of emergency ICTs. The presence of nonhuman actants (such as geographical location and outside technologies) and human heterogeneity (such as private companies and multiple users) have led to technological anomalies in emergency work processes. These technological anomalies have in turn, I argue, created a *functional disconnect* between ICTs designers' perceived need for and function of emergency ICTs, and their perceived need and use by emergency responders.

Having presented the *functional disconnect*, I now move to analyze the *ideological disconnect* between ICTs designers' definitions of the need for and intended use of their technologies, and the ideological understandings and definitions provided by emergency responders.

Chapter Seven: Collective Activity and Ideological Disconnects: Examining the Social Arena of a Multi-Agency Incident:

Introduction

In the previous chapter, I argued that emergency ICTs designers describe their technologies as tools of knowledge management intended to increase information sharing and communication capabilities for emergency responders (see Chapter Five). These technologies have been designed to improve workplace efficiency by making police officers, paramedics and fire fighters 'mobile knowledge workers', capable of receiving, coding and disseminating incident information both on and off scene. In Chapter Six, however, I demonstrated a critical *functional disconnect* between how these technologies and their applications have been designed to operate, and their in-situ application by emergency responders. While this disconnect focuses on individual social world activity (i.e., within policing, fire fighting or EMS), a great proportion of emergency responders' work activities overlap with their various social world counterparts. It is during the intersecting and collaborative work processes of police, fire and EMS that the social problem of 'inadequate emergency interoperability' becomes visible.

This chapter moves, therefore, beyond a specific analysis of a social world's interaction with technology to a broader social arenas analysis of the *collective* and *intersecting* work activities involved in a multi-agency incident. A multi-agency incident is any incident requiring more than one social world of emergency response (i.e., police, fire, EMS) to respond. To date, there has been very little written about the intersecting

and collaborative work practices of 9-1-1, police, fire and EMS. Indeed Sorensen and Pica have argued that,

> Within the general study of mobile technology use in work settings, there is a need for as theoretically informed analysis of the relationships between the situational aspects of work, the institutional context of work and the use of mobile technologies supporting work (2005: 126).

As an introduction to this area of study, I first explore the impact of ICTs on emergency responders' local, situational, and organizational work processes. Employing a social worlds/arenas framework, I then analyze the *intersection* and *social legitimation* of work processes within a multi-agency incident (Strauss, 1978b).

Processes of Authenticity and the Role of Ideology

Concerns over the legitimacy of a social world's activity involve questions about its authenticity. Authenticity, as described in Chapter Two, refers to "the quality of action, as well as to judgments of which acts are more essential" (Strauss, 1978b: 123). Questions concerning what is 'truly authentic' are rooted within the *ideological practices* of each social world (Strauss, 1984). As explained in Chapter Two, every social world has its own ideologies which guide the interpretations and actions undertaken by its participants (Strauss, 1978b).

Ideologies are "any body of systematically related beliefs held by a group of people, providing that the system of beliefs is sufficiently basic to the group's way of life" (Strauss, Schatzman, Bucher, Ehrlich, & Sabshin, 1964: 8). For present purposes, ideology refers not to an individual's system of beliefs, but to the *collective* or *shared* set

of beliefs and ideas of ICTs designers, police, fire fighters and EMS. These ideologies involve conceptions and definitions of the need for technologies, information and emergency interoperability. These ideologies, I argue, become embedded within the technologies, standard operating procedures and work practices operating within each social world.

As Strauss et al. note in their study of psychiatrists:

> Institutions produce ideologies because the specific context of work conditions in which a particular ideological approach is applied leads to elaboration, further development, and modifications in approach. Ideology as an abstract system of ideas is mediated by operational philosophies – a point that must be strongly emphasized. Operational philosophies are systems of ideas and procedures for implementing therapeutic ideologies under specific institutional conditions (1964: 360).

The important point is that under similar work conditions, social worlds operate differently because of their ideological position (Strauss et al., 1964).

Being attentive to the ideologies present in policing, fire fighting, EMS and emergency ICTs design uncovers varying perspectives toward information sharing and the problem of emergency interoperability. For example, police define information sharing as essential for intra-social world participants (i.e., between various police agencies), but not as necessary for across social worlds (i.e., between police, fire and EMS). This ideological perspective, I argue, becomes embedded within work practices and the use of emergency technologies. Comparing police ideologies to those held by ICTs designers, who perceive information sharing and emergency interoperability as essential for *both within and across social worlds*, draws attention to a critical *ideological*

disconnect (see Chapter Five). This ideological disconnect is the central focus of the present analysis.

Throughout this chapter, I argue that there are two *ideological disconnects* operating: (1) between emergency ICTs designers' conception of the need for and intended use of their technologies, and the understanding, implementation and use of these technologies by police, fire and EMS; and, (2) among the social worlds of police, fire, and EMS definitions and perceptions of emergency interoperability and the need for information sharing. These *ideological disconnects*, I argue, result from organizational contexts (such as differing access to technology and varying ideological understandings of the use and function of technology), and varying social world systematic sets of beliefs, understandings and definitions of 'emergency interoperability'.

Although these ideological disconnects are distinct, they can also lead to a *functional* disconnect as emergency responders incorporate, adapt and use their technologies in a manner different from how they have been designed to function. The present analysis, therefore, sheds light on how these varying, and at times contradictory, definitions of interoperability impact emergency response work processes and the use and function of emergency ICTs.

Through the application of a multi-agency 'Tiered – Response Vignette' I illustrate[23]: (1) the important role boundary objects, specifically ICTs, occupy for establishing and maintaining social order[24]; (2) how police, fire and EMS work practices

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[23] See Chapter Three for a detailed description on vignettes and the process undertaken to develop the present 'Tiered-Response Vignette'.

[24] As defined in Chapter Two, boundary objects are objects with a fixed purpose within a specific social world but flexible enough to be adapted and used across various social worlds.

intersect; (3) how intersecting work practices can lead social worlds to engage in processes of social legitimation; and, (4) how the use of emergency ICTs helps police, fire and EMS to establish distinct boundaries and acquire legitimacy and authenticity for their place and activity within the social arena of a multi-agency incident. From this discussion, I highlight how the local, situational and organizational work processes of emergency responders can not only disrupt information and communication interoperability, but further lead to differing uses and functions of emergency technologies.

Examining Collaborative Work Within A Multi-Agency Incident

Although the organizational structure and layout of the *Rural* and *Urban* EPS differ from each other, the similarity between both settings lies in the local, situational and organizational impact of social world participants' ideologies toward information and communication sharing. To best illustrate the conceptual and thematic concepts of boundary objects, intersection and legitimation processes, a Tiered - Response multi-agency incident common to both settings is used.

Both the *Rural* and *Urban* EPS work under a Tiered-Response agreement. Tiered-Response calls are also referred to as 'Tiered-Three calls' by emergency responders as these emergency calls require the dispatching of all *three* agencies to a high priority EMS call for service (EPS, 2002b). Serious car accidents or patient who does not have vital signs are examples of high priority EMS calls. Tiered-Response agreements have been created by municipalities to ensure that police, fire and EMS:

> ...routinely provide the type and level of service authorized and / or expected by the community in a timely and reliable manner. From time to time, to meet peak demand or extraordinary resource utilization, it may be necessary to request assistance to answer a call or to provide additional resources. This is the concept or intent of Tiered-Response (EPS, 2002b: 1)

In both the *Rural* and *Urban* case study, Tiered- Response calls are to lead to the dispatch of fire and police to every high priority EMS call. Although Tiered-Response is considered a dispatch of three agencies,

> It operates differently depending on the severity of the incident, arrangement with the municipality and the manpower available *(Interview # 16, Rural EMS Communications).*

Police, therefore, are not dispatched to all medical emergencies but are instead dispatched when the call is recognized and classified as 'vital signs absent', 'major car accident' or 'posing immediate physical danger to emergency responders'[25]. As one police officer noted:

> Generally we don't participate in a Tiered type response. A lot of municipal agencies do. Ambulance is more driven by Tiered-Response than we are and a lot of that is driven by the medical. If the ambulance cannot arrive in

[25] An important note concerning the classification of EMS calls and 'Tiered-Response' is that the decision to dispatch EMS and fire, or to dispatch EMS, fire and police is dependent upon the call-taker eliciting enough information from the caller on: (1) the severity of the medical situation, and (2) the presence of physical dangers. While this may appear straightforward, during a highly emotional situation (such as a heart attack, etc.,) the gleaning and interpreting of information can be extremely difficult for call-takers (see Garcia & Parmer, 1999a; Manning, 1988; Whalen & Zimmerman, 1998; Whalen & Zimmerman, 1990; Zimmerman, 1992). As one fire fighter explains, "for some people the accident is the end of the world basically. So as a dispatcher it's very difficult for them people. They're sitting at the end of the phone taking a message from a person that needs help and they're letting on that you know this car accident that's happened is the most terrible thing that they've ever seen in their life, and yet when we get there we find out it's a fender bender, you know, and that poor dispatcher hasn't got the capability of being able to see what's actually happening there. They're only going by what they're being told, so that's difficult, that's really difficult" (*Interview # 01. Rural Fire Fighter*).

> five minutes then they will tier off to the fire department, because they are cross-trained in defibrillators and all else like that (*Interview #08, Rural Police).*

Tiered-Response, therefore, is not always a three agency response, as the "overriding consideration for Tiered-Response agreements is a clear response time advantage by one of the partner agencies during a response to a life threatening call" (EPS, 2002b: 1).

Prior to the implementation of Tiered-Response agreements, both case studies established "informal agreements for mutual assistance in medical emergencies and other areas. More recently governments are making these agreements mandatory…" (EPS, 2002b: 1). Since Tiered-Response calls are largely responded to by fire and EMS, the contractual agreement is made between the municipality and the local fire department. The logic behind the Tiered-Response agreement is that fire can arrive at an EMS call more quickly than paramedics because there are more fire trucks and fire fighters available than ambulances and paramedics. Tiered-response, therefore, is established to reduce response times and lead to faster medical attention (EPS, 2002b).

In both the *Rural* and *Urban* settings, fire fighters and police, because they may arrive at an incident before EMS, are given the medical knowledge and skills required to perform life saving techniques. For instance, both the *Rural* and *Urban* fire trucks and police cars are equipped with life saving technology, such as defibrillators. Fire fighters and police officers are also trained to use these medical technologies and perform lifesaving medical techniques such as cardio-pulmonary resuscitation and artificial respiration.

However, the medical training of police officers and fire fighters has created blurred and fluid work boundaries between police, fire and EMS. In what follows, I argue that the blurring work boundaries present in emergency response have led police, fire and EMS to engage in processes of legitimation as a means to acquire authenticity and to establish and maintain distinct work boundaries. Since a Tiered-Response call requires collaborative interaction, it acts as the perfect example for analyzing boundary objects and the intersecting and social legitimation of work processes involved in a multi-agency response.

A Tiered-Response Vignette[26]

> A call is received at 9-1-1 where the caller is greeted with "9-1-1 do you require police, fire or ambulance". The caller responds that an ambulance is needed. The 9-1-1 call-taker electronically transfers the call to the corresponding EMS call-center. The EMS call-taker answers the phone "EMS how can I help you?" The first information required is the caller's name, call-back number and incident location. Once this information has been received, the call-taker then asks about the emergency.
>
> The caller begins to explain that her husband has been severely injured and is not breathing. From here the call-taker asks a number of medical questions, such as the name of the injured parties, are they breathing, do they have a pulse, etc. Depending on the answers, the call-taker will continue with medical follow-up questions and first aid instructions for the caller[27]. Once the information is received, it is electronically transferred to the corresponding zone dispatcher. Upon receiving call information, the dispatcher identifies, from the standardized computer address information and the EMS wall map, where the call is located and what paramedic zone is required. The dispatcher then dispatches the paramedic working closest to the emergency caller's zone.

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[26] The 'Tiered –Response Vignette' is not an actual situation, but instead a compilation of examples provided during interviews with EMS, police and fire communication center workers, police officers, fire fighters and paramedics (see Chapter Three for a detailed discussion on the 'Tiered-Response' vignette).

[27] Refer to Chapter Four for an example of the scripted questions asked by EMS call-takers.

Since the call concerns a non-breathing victim, it fits the criteria for a 'Tiered Response' call. After completing the ARISS-II CAD report, the EMS call-taker, through direct calling, notifies the local fire department. The EMS call-taker provides the fire call-taker with the name, phone number, incident location and medical classification (i.e., heart attack, vital signs absent, etc.). Once the EMS call-taker has forwarded the call information to fire, the EMS call-taker becomes removed from the incident until contacted by the paramedics working the call.

The fire communication call-taker notifies the corresponding zoned fire hall and sends a radio dispatch. The fire fighters are then dispatched to the emergency. The assigned radio dispatcher at the fire hall receives the information from the fire communication centre and passes it on to his / her en-route platoon.

When fire and EMS arrive at the incident, they begin to assist the person injured. While interacting with the residents of the home, fire and EMS realize that the injury has resulted from a gun shot wound. Once a gun or assault weapon is noted, the emergency becomes classified as a police emergency. A Fire fighter radios the fire dispatcher to request police assistance. The fire call-taker contacts the police communication centre and relays the call information acquired through the caller and on-scene emergency responder.

The police call-taker electronically transfers the caller information to the corresponding zone police dispatcher. Since the emergency involves a gunshot wound, the emergency receives a priority one classification[28]. Once classified, the dispatcher verbally dispatches the information to the corresponding zoned officer

The officer receiving the dispatch gets all the call information and has electronic access to the location and caller's background information (such information could include the caller's profession, previous police contact or residential hazards). The police officer is told that there is previous location information for this address. The CAD shows that police have been to this location twice in the past because of domestic assault

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[28] Police have three levels of priorities when dealing with calls. A priority 1 is the highest ranking priority and requires immediate police attention and involves such incidents as "actual or potential danger for bodily injury or death, or an officer requires immediate assistance, or crimes in progress or imminent, or the suspect is at the scene and likely to repeat the offence or flee to avoid apprehension"(EPS, 2002a: 1). A Priority 2 is an incident where the crime is no longer occurring but there may be witnesses on the scene. A Priority 3 includes no physical evidence to collect, no injuries or potential injuries and the suspect is not a threat. On a priority 3 the officer is required to respond within 24 hours of having received it (EPS, 2002a).

> allegations. There is a further note that the man of the house owns a weapon.
>
> The police officer processes the verbal incident information, makes short field notes on his/her pad of paper that is attached to the car dashboard, and heads to the scene. Once on scene, the officer takes charge of the incident. The officer begins by talking with the other emergency responders to find out more of what has been happening and what they know. The officer then begins to question and lay any relevant charges against the people involved in the incident.

Boundary Objects: Fluidity and Plasticity of Emergency ICTs

In order to understand the work processes and functioning of emergency ICTs during a multi-agency incident, such as a Tiered-Response call for service, it is imperative to first understand the interactional and negotiated processes engaged in by emergency responders. During a multi-agency incident, each social world comes to work with or comes to the aid of the others creating *collective action*. Collective action includes not only work processes, but also interactional processes between distinct social world participants (Strauss, 1993).

As described in Chapter Two, organizations (and social worlds) are not reified, static, and all encompassing 'structures' that stand independent of and guide human actions. Instead, they arise through ongoing interactional and negotiated processes (Strauss, 1978a). When agreement is reached on negotiations, they can solidify into structures, which appear obdurate and become taken-for-granted until something disrupts them. As Fujimura (1991) explains, people translate their personal and collective experiences into meanings which act to shape social structures, making them real in their consequences.

Structures, as defined by Strauss, include the classifications, standard operating procedures, technologies and spatial processes incorporated within their functioning (1993). While each of these structural conditions influence work processes, they are themselves created, maintained and sustained through peoples' interpretive and situational activity. Technologies, therefore, "are always embodiments of human and other agencies, codified and rigidified in particular ways that can render them structural elements of situations" (Clarke & Star, 2003: 553).

The human agency involved in the construction, application and maintenance of technology becomes black boxed and rendered invisible because of the unquestioning adoption and use by human actors (Latour, 1987b). Technologies, such as CAD systems and interoperable radio systems, become technologies through the context of action and must, therefore, be studied in action (Bowker & Star, 2000) .

It is during a multi-agency incident that the negotiated and structural contexts (such as standard operating procedures and technologies) required to establish, construct and maintain social order become apparent (Strauss, 1984). Social order is not established primarily through the implementation and use of emergency ICTs, nor is it solely established through the interactional processes of emergency responders. Instead, social order is co-constructed through social and material negotiations.

A multi-agency incident, and the necessary collective action required to establish social order, are accomplished through the ongoing social and material negotiation of boundary objects. Boundary objects, as described by Star and Griesemer (1989), have the ability to construct cooperation among multiple intersections of work processes

across distinctly different social worlds (Star & Griesemer, 1989). For instance, boundary objects can facilitate cooperation and collaborative action between the caller and call-taker, or between the fire communication centre and the EMS communication centre, or between a fire fighter and a police officer. Star argues that:

> Real world information systems are distributed and decentralized, they evolve continuously, embody different viewpoints, and have arms-length relationships between actors requiring negotiation....The information in an open system is thus *heterogeneous*, that is, different locales have different knowledge sources, viewpoints, and means of accomplishing tasks based on local contingencies and constraints (1989: 45 italics in original).

In order to achieve autonomous decision-making, members of a social world create boundary objects that are flexible and adaptable within a collective course of action (Star, 1989). As Fujimura explains, boundary objects facilitate the coordination of efforts and work processes of members of several different social worlds (1992). Boundary objects emerge through work processes and facilitate the multiple transactions needed to construct agreement among the various social worlds.

By their very definition, boundary objects are fluid and hold varying meanings, identities and functions, depending on where one is localized within the social world (Mol & Law, 1994). They act as a means of solving the problems that arise from heterogeneous work activities because:

> They are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use and become strongly structured in individual-site use (Bowker & Star, 2000: 297) .

Thus, boundary objects act as interfaces between the police, fire and EMS to facilitate collective action by opening the lines of communication and information sharing across multiple intersecting lines of work.

Boundary objects provide understanding as to *how* emergency personnel balance the different emergency classifications, categories and meanings involved in a multi-agency incident. The production of boundary objects is one means of satisfying these potentially conflicting sets of concerns (Star & Griesemer, 1989). As demonstrated throughout the 'Tiered-Response Vignette', collaborative and collective activity was accomplished through the negotiated labour of communication workers with their emergency ICTs. These emergency ICTs, I argue, act as boundary objects within emergency response.

Although the roles of communication workers and the uses to which ICTs are put are well defined and structured within each social world, both worker roles and technologies have a built-in flexibility that allows them to function across the many geographical borders and work boundaries present in emergency response. Both the *Rural* and *Urban* emergency responders emphasized the central role communication workers and emergency ICTs hold for establishing and maintaining social order on-scene. The 'Tiered-Response Vignette' indicates the central role communication workers and ICTs hold for co-constructing social order. These communication workers are described as the *central hub* of emergency response. As one officer noted,

> Any failure in communications is unacceptable, so what we continually work towards is making the *infrastructure of the radio system as robust as possible* so we have no

> barriers. …The most critical thing for our field officer is that they need to talk to *either of the dispatchers* or amongst themselves. And anytime there is a failure it is not a good time (*Interview # 19, Rural Police*).

Interoperability, therefore, is not solely achieved through the implementation and use of emergency ICTs. Rather, communication workers working with ICTs can modify standard operating procedures and classifications to facilitate collective and cooperative action when an emergency situation requires flexibility. When a call for service is first received, it is managed, defined and initially classified by communication workers. Not only do these workers act as the first site for emergency response, but they also act as the means for communication and information sharing *within* and *across* the various emergency agencies.

These call-takers hold an important position within emergency response as they are able to cross the many geographical and work boundaries between the emergency caller and the various front line responders (i.e., police officers, fire fighters, and paramedics)[29]. The following quote was not an uncommon sentiment within Emergency and Protective Services (EPS):

> So our communication centres are the quarterbacks of our organization from the radio and call-taking process. They are the focal point that sends out the information that *controls* the occurrences and *controls* who goes where and *shares the information accordingly*. So, they *control* all that and as a result of that they become the resources, you know the *resource library* as a lack of a better term, but they need to know the system that much better than a front line officer (*Interview # 08, Rural Police Officer*).

[29] Due to space and time constraints I am unable to fully explore the important mediating and fluid role of emergency communication workers. In Chapter Eight, however, I discuss how emergency communication workers could be regarded as fluid 'boundary workers', capable of crossing the various geographical and virtual work boundaries operating within emergency response.

The officer cited above identifies the *overlapping* role emergency ICTs and communication workers hold as call-takers and dispatchers only become accessible to emergency responders through the aid of ICTs.

Communication workers have access to an unlimited amount of coded and classified information. They largely control the type and amount of information to be shared. For instance, the information shared with paramedics and fire fighters comes directly from the call-taker because these emergency responders do not have remote access to these data bases. The information acquired by police, on the other hand, is dependent upon their access to mobile Record Management Systems (RMS) and Computer Aided Dispatch (CAD) systems.

As described in Chapter Four, only a limited number of *Rural* officers have access to mobile RMS and none of their RMS are dispatch oriented (see Chapter Four for details). However, even when officers have access to dispatch-oriented RMS, such as in the *Urban* setting, they have only a limited amount of time to search, retrieve and read the available information (see Chapter Six for a discussion of time constraints for retrieving and sorting information). Therefore, the quantity and quality of information provided to officers is dependent upon the interpretive skills of their communication workers[30]. The maintenance and construction of social order therefore, is influenced by the flexibility accorded communication workers to modify ICTs use.

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[30] See Chapter Six for a discussion of the difficulty faced by officers to quickly read and interpret RMS and CAD information while responding to an emergency.

Communication workers use ICTs to connect emergency responders and to provide information to them. However, as noted earlier, worker roles and the uses of ICTs as boundary objects are not limited by physical space or time, but can be flexible, adaptable and fluid. Thus, not only can communication workers use ICTs to connect with emergency responders in different social worlds. Through innovative means, workers can also provide information beyond what is intended through the use of ICTs. The following quote by a police call-taker illustrates how a different agency communication worker (EMS) innovatively shares information.

> They're absolutely wonderful at communicating information without the caller actually knowing. Because they will repeat addresses, as far as the public is aware to verify a location, but really what's happening is they're telling their neighbour where to send that ambulance. 'And you know, did you say one person trapped? You know, are they moving?' So we're getting the medical information, and ambulance will still ask the complainant if they have them on their air (*Interview # 10, Rural Communication Centre*).

It should be noted that the sharing of this information is only made possible through the mediating role emergency ICTs, as boundary objects, play within a multi-agency incident. However, the ways in which these technologies are used can vary, depending on the social world under review.

For example, the role played by fire dispatchers differs depending on the technology being used. As one fire communication employee noted:

> Fire dispatchers are less intensive on the phone than police, but more intensive on the radio. We are part of incident command, meaning that the dispatcher and incident commander on the scene communicate continually with status updates on how the fire is going

> and asking for help to get things (*Interview #24, Urban Fire Communications Coordinator*).

Fire dispatchers are not bound by physical locality, but are able to assist in emergency response by using ICTs to maintain continual communications with the fire fighters both on and off scene to ensure there is sufficient equipment and manpower available[31]. For instance,

> Fire dispatchers will have to manage the equipment that goes in and out and will have to know which pumpers are there and aren't there and which ones are available in the city and which will be reallocated and which ones are available for follow-up (*Interview #29, ICTs Designer*).

The information acquired by call-takers and dispatchers, therefore, becomes expanded and transportable through emergency ICTs, such as CAD systems, RMS and interoperable radio systems.

Although the provision of emergency response information is aided by CAD systems and transported via the interoperable radio systems, these technologies, as boundary objects, do not operate independent of the call-takers. Rather, as numerous emergency responders have noted, communication workers are central figures within emergency response, and their innovative use of ICTs is integral to interoperability. Further, as might be expected, emergency responders in different social worlds also shape ICTs as boundary objects to their local needs (as was evidenced in Chapter Six).

From a theoretical point of view, as was discussed in Chapter Five, ICTs designers' link agency and 'authoritative knowledge' to their technologies. In this

[31] Although fire dispatchers are physically located in their communication centre, they are still capable, through the aid of emergency ICTs, to assist in the emergency response located elsewhere. Thus, the overlapping work processes of communication workers and their ICTs renders fire dispatchers capable of operating across geographical boundaries.

chapter, paradoxically, it has become evident that the effective use of boundary objects such as ICTs in communicating information in intersecting social worlds requires hidden and negotiated socio-technical labour by communication workers. Indeed, the effectiveness of ICTs in communicating information seems largely dependent on the innovativeness of workers who shape knowledge production in ways unintended by ICTs designers.

Having presented a detailed account of how ICTs, as boundary objects are "shaped to adapt to local needs and the constraints of the several parties employing them" (Star, 1989: 393), I will now begin a closer examination of collaborative action to see how the intersecting work processes of police, fire and EMS affect the functioning and use of emergency technologies.

Collaborative Action: The Intersection of Police, Fire and EMS

Police, fire and EMS enter emergencies with their own ideologies, standard operating procedures, classifications and technologies (see Chapters Four, Five and Six). As the *Urban* Director of EMS notes:

> In construction you have plumbers and electricians and they all work on the house but have different jobs, so does police, fire and ambulance, they are *completely different* (*Interview #28, Urban EMS Communications*).

The varying contextual conditions found within policing, fire fighting and EMS, I argue, impact collaborative action and thus require analytical attention. For instance, the 'Tiered-Response Vignette' illustrates how the work practices of police officers, fire fighters and paramedics come to intersect during a multi-agency incident. Each

participant in a social world approaches a call for service aware of its guiding ideologies. These ideologies are used to define the situation and direct collective action (Strauss et al., 1964). A serious car accident, for example, requires the fire department to aid in extricating any trapped passengers, and to deal with any hazardous materials on scene. EMS, on the other hand, is required to provide medical assistance to any injured passengers, while the police are responsible for investigating and laying any relevant criminal charges. While these duties, as presented here, sound straightforward and distinct, during the course of a highly emotional incident, they quickly become overlapping and complex.

It is during the intersection of social worlds' work processes, like those described in the 'Tiered-Response Vignette', that the ongoing negotiated work and interactional processes become visible (Maines & Charlton, 1985; Strauss, 1978a, 1978b). At times, a social world's procedure is followed and directs the collaborative action taken, while at other times the agency's standardized procedure becomes transformed through the actions and standards of another agency. Below is an excerpt from an interview with the *Rural* EMS communications officer describing this negotiated process:

> … each of them has different priorities. I use fire and EMS in that particular scenario and they would work together to extricate the person, so if it is a patient issue the paramedics would take the lead and say 'This patients needs to be extricated but they have a fractured neck, so extricate in this manner so you can maintain immobilization' or the fire department may say 'This is the way we have to extricate because this is the only way the roof will come off, can you stay with us?' So, they would communicate back and forth that way….So they kind a work those issues out as they

> work together (*Interview # 12, Rural EMS Communication Centre*).

The quote above reveals the various negotiations and changes in activities that can occur during a multi-agency incident. For instance, the fire fighter's job is to remove the patient as quickly as possible from the vehicle, but for EMS, the job is to immobilize the patient's neck. As the EMS worker above notes, many of the actions taken during a multi-agency incident occur as the scene progresses. Such local 'work – arounds' enable emergency responders to collectively establish an agreed upon approach to the situation as it unfolds.

The ability to define and classify the 'priority' of the emergency as being primarily a 'police situation', 'fire situation' or 'medical situation' can lead one social world to direct and guide the collective action taken within the social arena. As the incident occurs, the priorities of the situation and required work processes can change, requiring different emergency classifications to be applied, and a different social world to guide and define the collective action. It is during the overlapping and intersecting work processes of emergency responders that an ideological disconnect between the design of ICTs and their in-situ application becomes apparent. In the pages that follow, I lay out the important role that social world ideologies (specifically organizational contexts and definitions of information and communication sharing) maintain for a social world's adaptation and use of emergency technologies.

Specifically, to illustrate the ideological disconnect I will: (1) outline the impact of *organizational contexts* on social world work boundaries and the various definitions and uses of ICTs by police, fire and EMS; and (2) illustrate how the social legitimation

processes employed by police, fire and EMS have created differing and contradictory social world ideologies toward information and communication sharing. These various social world ideologies, I argue, have led to an *ideological* disconnect between ICTs designers intended use and function of emergency ICTs, and their in-situ application by emergency responders.

Organizational Contexts Impact on Work Boundaries and Definitions of ICTs

Examining the intersection of various emergency social worlds' activities highlights how the local, organizational and work contexts influence patterns of collaborative interaction and the use and function of emergency technologies. For instance, a social world's organizational context can impact: (1) its access to technology and technological skills, and (2) its ideological understanding of technological functions.

A social world's access to both technology and technological skills can vary. These variations can in turn lead to an ideological and functional disconnect between the design and intended function of a piece of technology, and its in-situ application. Chapter Five describes the portable radios as tools essential for enhancing work efficiency and emergency responder safety by connecting police, fire and EMS with both their dispatchers and other emergency responders. However, the actual application and understanding of this technology by emergency personnel indicates an opposite effect.

Both the *Rural* and *Urban* Emergency and Protective Services (EPS), for example, operate on two different radio systems (see Chapter Four). Operating on two different systems creates significant disruptions to emergency communications. For

instance, within the *Rural* setting both police and EMS operate on the same radio, while fire works from the local municipal radio. The following quote, by a *Rural* fire fighter, explains the problem of communication interoperability:

> If it's a big scene… it's quite a problem where you know, if you have an officer sitting up the street … directing traffic, and you have a traffic problem down where you are, we can't talk to him, unless you go on foot. It's an obstacle. (*Interview # 04, Rural fire fighter*).

Within the *Urban* setting, on the other hand, fire and police operate from the city's regional radio system while EMS works on the provincial radio system. As the following *Urban* EMS worker notes:

> The only agency that we have interoperability with is the provincial police right now, because it is a provincial [radio] system. We don't have connection to [our city] police because they are on the city network. The city has an 800 megahertz system that includes fire and police, and it would have been nice to have EMS with them because we do a lot of responses together, Tiered-Response, special events… (*Interview #28, Urban EMS*).

Both the fire fighter and paramedic above express the desire for shared technology and note how organizational and work contexts, such as provincial / municipal ownership and their incorporated technologies, lead to technological anomalies and difficulties for acquiring emergency interoperability.

While the 'Tiered – Response Vignette' depicts a multi-agency incident as involving EMS, fire and police, a multi-agency incident can also involve the intersecting of units within one specific social world. For example, a call may require the work of two different police agencies, or two different fire stations or even two different paramedics. Organizational contexts can also lead to internal social world disruptions.

For example, police within the *Urban* setting often find themselves working with the provincial police and neighbouring regional police. The following quote by an *Urban* officer highlights the organizational impact on work processes as they relate to information and communication interoperability.

> Right now we don't have any communications with [the neighbouring police], so we have to go through our *dispatcher* which in turn goes through their *dispatcher*, so you know, you figure all that phone conversation leads to a 3-4 minute time delay to get the update, which is a huge, huge time for us, because you can travel a distance in that amount of time (*Interview #27, Urban Police Officer*)

These internal social world disruptions lead to differing perspectives on the use and function of ICTs.

Emergency ICTs, although described in Chapter Five as a means for increasing information and communication sharing between police agencies, are perceived by emergency responders as stand-alone technologies, incapable of functioning properly in a multi-agency incident. When a multi-agency police situation arises, it requires negotiated work processes to occur between the various agencies and, more specifically, between their various communication workers. During these situations either an agency has to give up its technology and share with the others, or it has to create a 'command post'. Usually the latter action is chosen. Below is a quote by a *Rural* police officer explaining the processes taken during a multi-agency (joint forces) incident:

> When we do a fully joint force type of situation there are a couple of options. We either get something that allows us to do interoperability or we go to a unit by command where we actually have a person from each agency demanding a radio from each agency and kind of bridging it through the units' component as opposed to

> the electronics component, or we simply exchange equipment (*Interview #03, Rural Police*).

A command post, like that described above, integrates the use of communication workers and ICTs for creating interoperability and establishing social order.

Another organizational constraint to emergency interoperability lies in the various, and often contradictory, definitions held toward the functioning and capability of ICTs. These varying definitions and understandings have in turn created an ideological disconnect between how designers have conceived of and interpreted the use of these technologies, and the understandings and definitions provided to them by emergency responders. Within both case studies, for example, there were contradictory understandings concerning the use and function of the portable radios. Within the *Rural* EPS, both police and EMS operate on the same radio system. One of the functions emphasized by the police and EMS radio designers is the presence of a common and 'interoperable channel'. While there is an 'interoperable channel' on the radio system, many of the *Rural* police officers and paramedics interviewed were unaware of this function. Furthermore, both the *Rural* police officers and paramedics came to view and use their radio system as though it was a stand alone system.

When I inquired into these differing understandings of technological capabilities, the *Rural* Ambulance Director noted:

> The paramedic or officer *can* contact their *communication centre* and ask to speak to the other agency. The groups are then moved into a talk group by the dispatcher whereby they can speak to each other. They are unable to hear any other transmissions and the process is cumbersome. Upon discussion with one of my supervisors it was apparent that a lot of staff are unaware of this capability…There are lots

> of possibilities for this lack of knowledge, and it is worth pursuing (*Interview # 18, Rural EMS*).

Since many of the emergency responders were not aware of this capability, much of the work was interactively negotiated while on-scene or through their respective communication centres.

As in the case of the *Rural* EPS, the *Urban* case study also revealed multiple perspectives toward technological capabilities. As outlined earlier in this chapter, the *Urban* EMS is not incorporated on the city radio system, but instead operates on the provincial radio system. The *Urban* police officers and fire fighters, however, believe they maintain communication interoperability across all three agencies (i.e., police, fire and EMS). The following quotes were common sentiments expressed in interviews with the various police officers and fire fighters:

> The city …. has the same radios, so do paramedics, so do fire, so they were not designed specifically for police work. We are all on the same radio, but different channels and we are on what is *called a patch that we can put in and all go on to have a command channel* (*Interview #26, Urban Police*).

> We have interoperability with the radio system to talk to police and ambulance if the need be. It is a certain channel we can go to and it is in all the radios…(*Interview #23, Urban Fire Fighter*).

Such differing perspectives and definitions of technological capabilities between police, fire and EMS raise questions concerning work cohesion and the understanding of emergency interoperability.

Organizational contexts, such as access to technology and social world ideologies, can lead not only to technological anomalies, but also to a *functional disconnect* between

how emergency ICTs are designed to function and their in-situ application. When emergency responders are faced with disruptions to their communications or work processes, they must create compensatory collective activity through the negotiative and flexible labour of communication workers with their ICTs. As the following *Urban* police officer notes:

> If I am dealing as a response officer at a major incident and something is going on, and the fire departments there, and we are here, and paramedics there, if I need a paramedic I will yell for a paramedic and if I don't, I will call my command post and say 'We have got a guy down we need a paramedic' and they are sitting beside the paramedic supervisor saying 'We need a paramedic at this location', and boom it is done (*Interview #25, Urban Police*).

Thus, interoperability and consequently social order is not established solely through the implementation of emergency ICTs, but arises out of the intermingling and negotiated work processes of communication workers with their technologies.

Acquiring Social Legitimation and Distinct Work Boundaries

As the different emergency social worlds' work processes intersect, each begins establishing, maintaining and differentiating its work processes from the other (Strauss, 1982b). Indeed, social worlds, when acting within the social arena, engage in processes of social legitimation (Clarke, 1990; Strauss, 1984). As Clarke observes:

> Very important activities within all social worlds are establishing and maintaining boundaries between worlds and gaining social legitimation for the world itself. These processes involve the social construction of the particular world and a *variety of claims-making activities* (Clarke, 1990: 20 *italics added*).

Throughout emergency response, I argue, concerns over social legitimation arise based on each social world's interpretation of the situation, and the organizational contexts in which they interact. The use of claims-making activities concerning professionalism, specialized concerns, training, and technological sophistication are used to differentiate the various social worlds involved in a multi-agency incident. In what follows, I argue that emergency responders acquire social legitimation and establish distinct work boundaries through processes of *distancing*, *theorizing*, and *standard setting* (Strauss, 1982b see Chapter Two for a detailed description of each process). These processes in turn lead to different definitions and ideologies concerning the need for and use of emergency technologies.

Processes of Distancing, Theorizing and Standard Setting

The extent to which a social world actively and knowingly engages in the various process of social legitimation is not of primary concern for the present analysis. Instead, attention is given to *how* these legitimation processes lead to an *ideological disconnect* between ICTs designers' understandings and beliefs concerning the intended need for and use of emergency technologies, and the in-situ application of these technologies by emergency responders. While I define and describe the processes of distancing, theorizing and standard setting as distinct activities, they are often employed simultaneously by emergency responders.

As described in Chapter Two, social legitimation involves establishing the authenticity of the activities and ideologies held by social worlds. Authenticity, however, involves the imposition of judgments on the quality and necessity of another social

world's activities (Strauss, 1978b see Chapter Two). One process used by police, fire and EMS to acquire social legitimation was that of distancing. Distancing includes the active attempts by social world participants to differentiate their own work from others and to claim 'legitimacy' for it (Strauss, 1982a, 1982b). Processes of distancing, for example, involved claims-making activities by social world members that focused on their level of specialized training, technological sophistication and 'professionalism'.

Police, fire and EMS, for instance, engaged in a process of '*distancing*' by stating how each agency and corresponding work activity differs from the other. As the following *Rural* police officer notes:

> Everyone knows their role [at a major car accident] and my job then just becomes investigating the crash. Fire department's job is to deal with the fuel spill or to extricate the driver and the ambulance waits for the extrication; they load up the patient and take them to the hospital (*Interview #05, Rural Police*).

The quote clearly illustrates the demarcation of distinct job and work activities among the social worlds involved in emergency response.

Distancing is usually accompanied by an argument for the use of advanced technology and access to information. Paramedics, for example, can distance themselves by defining their work as being focused specifically on health and health procedures. In order for paramedics to conduct their medical work, they require different pieces of technology and classified information. Thus, information pertaining to a patient's previous criminal record is not necessary for a paramedic, but information about a past hospital record is. Being able to differentiate what information is required for various

social worlds to conduct their work activities, and acquiring access to 'specialized information' are both incorporated within processes of distancing.

The following excerpt by a *Rural* EMS worker demonstrates how access to specialized medical information is used as a means to differentiate EMS work, and consequently work boundary, from the work processes of fire and police:

> That is part of your protection, to have part of your information protected …and when we get that information *that is privy to us,* so that what we can do is relay it to the people *within that circle of care* so *they can be better equipped to deal* with your problem. *Not so that what we can do is take that information and pass it on to the fire department*, because what are they going to do with it? The fire are going there to initially provide *some level of care*, *police are going because of their staffing*…And I think one of the things we have failed to identify is that…Tiered-Response people do not, how do I put that, there is *not a need for that information to be shared.* It is *not of assistance*. When the information is passed on 'We need you for a medical emergency to such and such a location, it is chest pain', well you know what, they [fire] are going to go there and set up a monitor on them, *they are not going to give him drugs or intubate them*, *they are not going to do things that others are going to do*. They are going to go because they have the equipment (*Interview # 11, Rural EMS Communication Centre*).

The EMS worker above uses claims of 'specialized information' to distance his work processes from both fire and police. In this quote, the EMS worker identifies what the work of a paramedic is (i.e., to provide medical care through the administering of drugs / specialized medical techniques), as compared to the perceived work of fire (who are there to monitor the patient), and police (who are there "for staffing" and man power reasons). Emergency responders, therefore, engage in processes of distancing when they actively

define their place and actions within a multi-agency incident as unique and different from the activity of participants from other social worlds.

By engaging in processes of distancing, emergency responders construct ideologies about their own and others work activities. These ideologies are not only used to make judgments about one's own authenticity, but they also guide the social world's work processes and use of technology. Thus, whereas ICTs designers intend their technologies to enhance interoperability through the exchange of information, emergency responders regard these technologies and the information they provide as ways to establish and reinforce distinct work boundaries.

Police officers are capable of distancing their work processes from those of fire and EMS because of their legal authority. As the following *Rural* officer explains:

> I think the only reason we take charge of situations is because we have the *legal authority* to do that, whereas they really don't. … A paramedic doesn't. So if they have to direct somebody and they don't pay attention to the direction, they have nothing to fall back on. Whereas the police, you know if you're driving on a closed highway, we can remove you from that closed highway. *So pretty much we take over the scene*, we're like *contractors* and we sub out to all the others (*Interview # 05, Rural Police*)

The quote cited above highlights the legal power police hold within emergency response. The officer's comment illustrates his perception of his power within emergency response as the '*contractor*' the one with the ability to define the situation and guide collaborative activity. The ability for police to distance themselves from others has provided them and their work processes with social legitimation. This social legitimation is further acquired

through police officers' claims of specialized training and access to specialized technologies.

Not only can social worlds use processes of distancing to acquire social legitimation, but they can also engage in processes of theorizing. Theorizing, as described in Chapter Two, involves ideational *claims* of authenticity that legitimate one's own work activity while simultaneously attempting to debunk or discredit another's activity (Strauss, 1982b). Processes of theorizing are not strictly verbal claims but can also involve the use of materials, standard operating procedures and access to resources, such as ICTs (Strauss, 1982b).

As explained by Clarke (1990), social worlds attempt to acquire social legitimation through a variety of claims-making activities. Emergency responders, specifically police and EMS, I argue, engage in processes of theorizing through the use of claims purporting professionalism. There is a significant amount of research and literature on the sociology of professions (see Friedson, 1970, 1986; Pawluch, 1996; Shaffir & Pawluch, 2003; Strauss et al., 1985; Strauss et al., 1964). The purpose of the present argument is not to engage in, provide a critique of, or add to this literature, but to instead illustrate how these various social worlds engage in claims making activities about professionalism to acquire social legitimation. Claims of professionalism not only work to establish and reinforce distinct work boundaries, but they also become embedded within the social world ideologies that guide and inform their work processes.

When emergency responders engage in this form of claims-making activity, they are attempting to legitimate their own work and their own access to and control over the

flow of information, while simultaneously differentiating other social worlds' activities and access to information. As the following *Rural* officer notes:

> Police and ambulance know their role pretty darn good. Okay, like *very well*. Cuz we're both, you know, *we're professionals…trained to ministry standards*. You *know what protocols*, for the most part…Fire, like some of the *volunteer fire departments*, for example, they may start doing something and you go 'Whoa, don't touch that. You know, that's evidence, type of thing' (*Interview # 06, Rural Police*).

The quote above demonstrates how claims of professionalism are used to legitimate one's work ("police and ambulance know their role pretty darn good…we're professionals… trained to ministry standards"), while simultaneously discrediting the work of "volunteer" fire fighters. Although EMS and police do not fit the sociological criteria of a 'profession', as social worlds, both define the term to suit their purposes and, it would seem, connect it to matters of responsibility, and access to specialized information (Friedson, 1970).

Within emergency response, claims of professionalism were connected to specialized training, standardized procedures, access to advanced ICTs and government / legal mandates. Claims of professionalism, therefore, were aided by a social world's ability to engage in processes of standard setting. Standard setting includes the development and enforcement of standard operating procedures or legal standards and mandates over one's work activity (Strauss, 1982b). The officer's quote above illustrates how training to 'ministry standards' are used to legitimate police work and become incorporated with the claim of 'professionalism'. Standards, therefore, work to differentiate and legitimate police work from the activities of other social worlds.

Police and EMS both use processes of standard setting by defining their work activity within legal rhetoric. Both police and EMS operate under standardized procedures and government mandates. EMS, for example, operates under the 'Health Information and Protection Act', while both police and EMS operate under the 'Freedom of Information and Protection of Privacy Act'. Both of these legal mandates place organizational constraint on the amount and type of information police and EMS can share with other emergency agencies. Police and EMS access to caller information, and their decision to share this information with other social worlds, is grounded within claims of 'legal authority'. These legal mandates, I argue, are used to restrict the flow of communication between police, fire and EMS. This differentiated access to information within emergency response has in turn led to different ideological understandings of information sharing and the use / function of emergency ICTs.

For example, *Urban* fire and police work on a Versaterm designed CAD system which is justified by the argument that it cuts operational costs by removing duplication of efforts and decreasing response times. Chapter Five illustrated how Versaterm ICTs designers' constructed the police CAD and fire CAD to be interoperable, with information being automatically shared and updated on both systems. While these technologies have the capacity to be integrated, the *Urban* police have decided, based on the 'Freedom of Information and Protection of Privacy Act', to place a limit on the amount and type of information to be shared. As one ICTs designer notes:

> We could easily share information, but *it is up to each agency* to decide. In [this city's] case, they use a single CAD system; it is one application and one server that is hosting the police department and the fire department.

> What our system allows them to do is have central call-taking, so at the 9-1-1 positions, you could answer for both police and fire at the same position and enter the information into the system and depending on what call type it was, it would determine whether it went to a police dispatcher or fire dispatcher. But that is not how [the city] runs it. [The city] runs it so that their 9-1-1 center is on _____street in their communication center and they will answer the phone for police, fire and ambulance. If it is a police call, they will take the call at that location, but if it is a fire call they will actually downstream the call to the fire dispatching center, who will use the very same software, on the very same system and enter the call there. Our system allows that if you enter a fire call, lets say a large structural fire; it will automatically generate a police call, because they are part of the same system, so you don't have to duplicate answers. That is part of the sharing. So, we are in other sites, but not in [this city] because it is in how they chose to implement the system…[The city] just don't run it that way, *that is an operational decision* or otherwise known as politics (*Interview #29, ICTs Designer*).

Thus, the *Urban* fire and police department operate on the same technology, but the police decide what and how much information can be shared. This organizational decision has led to an *ideological disconnect* between ICTs designers' intended need for and use of the CAD system, and its in-situ application by police and fire.

Police and EMS use claims of standardized procedures and legal mandates to explain restrictions on information sharing:

> The theory is that the new fire system and our system will match, but the reality is that some of the information that we collect is *strictly governed by the rules of privacy*… Our expectation is that [fire] will keep information around hazardous materials in certain places so if we are sending somebody out then we can have that available to our officers as something to keep in the back of their minds as they enter into the place (*Interview #30, Urban Police Department*).

> I don't have direct access to this information or [another agency's] CAD. That kind of thing could and could not be beneficial. There are *privacy issues* that kick in. The 'Health Information and Protection Act' is really restrictive on the health care side, so there is not a lot of information that they are willing to share with us. And we are restricted with the Freedom of Information Act and there is some information that we cannot share with them. So, I mean you draw; there is a line between enough information that you can do your job and over information that restricts you from doing your job because …it leads to information overload (*Interview #11, Rural Communications Centre*).

Both officers above highlight the impact that standardized policies and procedures have on information and communication sharing. The ability to demarcate what information is specific to which social world and who may acquire access to this information works to establish distinct work boundaries between police, fire and EMS. Ideological understandings about information access and work processes guide emergency responders' actions within a multi-agency incident. These ideological processes are further incorporated within the adoption and application of emergency technologies.

Risk Management and Work Boundaries

Although emergency ICTs are described by their designers as tools of risk management used to inform emergency workers of the dangers they may face when entering an emergency situation, the present analysis indicates a second function. These technologies, I argue, not only act as tools of risk management, but they also provide a means to establish and reinforce work boundaries. For instance, ICTs designers' stressed the importance and value of the special 'hazard' feature provided on CAD and RMS for

informing emergency responders about any possible risks or dangers they might face (see Chapter Five). Although these features were stressed by designers and by various social world participants, the hazard information is only made accessible to individual social worlds and not the collective arena.

Due to government standards, such as the 'Freedom of Information and Protection of Privacy Act', some emergency responders, specifically fire fighters, enter a scene with little or no information on the call or location[32]. The following quote was not an uncommon sentiment among fire fighters:

> You were talking about information sharing with agencies and I find that is *one of the areas lacking* …because when 9-1-1 gets a call for ambulance, they flip the call to ambulance and dispatch ambulance, and then ambulance dispatch calls our dispatch. I remember one call where we go to this call and it was for a male unconscious and the address was flagged in the computer system as either a rooming house or some place … but had been flagged in the system for whatever reason and ambulance instructions were to wait for police before going there. Just that information wasn't passed along to us that night and we got there first and we pull in and our pump driver stayed with the truck outside and then he saw in the distance that an ambulance is sitting on the side, and then he walks up to the ambulance and asked 'Why are you sitting in here?' The paramedic said 'Well we were told to wait for police and these guys are really bad' and then we thought 'Oh great three of our guys are already in there'. But I know it has happened more than once, where we had information that wasn't passed along (*Interview # 23, Urban Fire Fighter*).

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[32] There are no government mandates or standards within fire that restricts fire fighters from sharing their information with both police and EMS. In fact, fire is to update and inform both EMS and police of any hazardous materials present in different municipality locations. Thus, fire's stored and coded location based information is open and accessible to EMS and police, while 'hazard' information stored on EMS and police CAD systems are not accessible to fire.

Although there had been 'hazard information' flagged within the EMS ARISS-II CAD system, it was not shared with the on-scene fire fighters. When information is not electronically shared, emergency responders must rely on social interaction and face-to-face communication to acquire relevant caller and location information, a fallback position ICTs were meant to correct.

The need to acquire information through social interaction was most emphasized by fire fighters. Fire, unlike police and EMS, do not have government mandates controlling the flow of their information. This has left many fire fighters to blindly enter emergency scenes. As one fire fighter explains:

> We can't be seeing information that a resident at a specific address has a spousal abuse charge on them or anything like that, it is just not right. The same goes with the Ministry of Health. They give us *very basic information* when we respond with the Ministry of Health…and they give us basic information on the patient at the time and they will say, 'There is a prior history with the patient,' and that is all they will give us and they won't tell us what the prior history is (*Interview #24, Urban Fire Fighter*).

Specialized medical information or location information, therefore, is not always provided to fire fighters when they are sent on scene. Although they are required to respond to medical emergencies (because of municipal agreements such as 'Tiered-Response'), they are not classified by EMS as a member of the patients 'circle of care'. This leaves fire fighters to gather pertinent medical and hazard information while on-scene through their social interaction and intersecting work processes with EMS and police. Emergency interoperability, therefore, is not acquired strictly through the implementation and use of ICTs (as organizational contexts and social legitimation

processes place restrictions on information sharing), but instead interoperability occurs through the social interaction and intersecting work processes of emergency responders.

Organizational contexts and social legitimation processes have created multiple and often contradictory definitions of information sharing and emergency interoperability. A social world's ideological understanding of emergency interoperability influences its adaptation and use of emergency technologies. The various ideological understandings of emergency interoperability have created an *ideological disconnect* between ICTs designers intended use and function of their technologies and the in-situ application of emergency ICTs by police, fire and EMS.

Multiple Ideologies of Emergency Interoperability

Emergency ICTs have been incorporated within emergency response to provide emergency workers with information and knowledge required to do their job quickly and effectively. These technologies have also been installed to enhance emergency responder safety by: (1) providing emergency responders with the means to communicate with their dispatcher and each other, and (2) to provide them with unlimited access to safety information (specifically hazard information). However, as illustrated throughout this chapter, these technologies are not always used in the way intended. Organizational contexts have led to restrictions being imposed on information sharing between agencies. As one officer states:

> There is a little bit of limit on information sharing, the other agency's concern would be 'Where are we going and why are we going?' They're not going to go into any place with a knife or a weapon without police presence. So *they don't need to know a whole lot of detail*. They're more concerned

> with *the medical stuff.* Lots of times they don't even get names for us, if they get the call first, because they're not interested in that end of it. Whereas the *police are interested in the public safety, officer safety, so we're going to go from that end.* So we're *coming from two different spots*, both to save the public hopefully… (*Interview # 03, Communication Centre*).

The officer cited above identifies how fire, EMS and police enter a multi-agency incident from different positions with different informational needs and requirements. These various demarcated work boundaries, I argue, are derived from each social world's ideological understanding of emergency interoperability. Indeed, the officer sheds light on the differing definitions connected to 'information sharing' within emergency response.

Emergency interoperability, although defined in a straightforward manner by ICTs designers as the need to instantaneously communicate, acquire and disseminate information, holds varied and complex definitions for emergency responders. As one participant explains it:

> Interoperability is a funny word that is *totally situational.* So *interoperable one day and one situation doesn't mean the same thing* to me the next day….(*Interview # 25, Urban Police*).

Emergency interoperability, therefore, does not possess a clear and well defined meaning. Instead, emergency interoperability is defined within its local, situational and organizational contexts.

The police, for example, define interoperability as the ability to access and share information within one's police department and across other police departments. They do not, therefore, define interoperability as the ability to share information among police,

fire and EMS. The following quote by a *Rural* officer outlines the varied definitions of and need for emergency interoperability:

> So as an organization we have to pick and choose … where we can make the most headway in our interoperability pursuit. With all these various styles of government … because like you said *for fire departments ... you have ...volunteers and that brings up a whole host of difficulties.* And the whole thing with *interoperability, like I said there are two areas, one is the day –to-day police interoperability which is 90-95%* of the time that you need that and *that is what we really concentrate on.* And then there is the planned and unplanned situations where you have an event that requires a large number of various ministries or users, radio users to have interoperability. … So the driving factor there becomes more of a protocol process, an agreed to protocol of who is in control of that incident or that situation, so you would have to have a lead agency or organization…The concept that everyone has to speak to everybody is a recipe for disaster... So you have multiple agencies and with all due respect to the other agencies, you have differing levels of professionalism and levels of users of IT…(*Interview #06, Rural Police*) .

There are a number of interesting processes and ideologies identified in the quote above. First, using processes of distancing and theorizing, the officer attempts to outline how police work is different from the work performed by other agencies involved in a multi-agency incident. The officer explains the differences among social worlds' work processes as linked to their respective level of professionalism and ICTs use.

Second, the officer demonstrates how social worlds' ideologies concerning emergency interoperability guide their work processes. The officer also defines two different categories or levels of interoperability: (a) interoperability among police departments, and (b) interoperability among different emergency agencies (i.e., fire, police and EMS).

Third, the officer notes a hierarchy of importance between these two types of interoperability. He explains that interoperability between police agencies is more critical and useful than information and communication sharing across emergency agencies because police deal more frequently with other police departments. Thus, he places greater importance on police interoperability because that is the 'day-to-day' operation, while multi-agency incidents are fewer in number and frequency.

Another example of varying definitions of interoperability is provided by an *Urban* Officer:

> Interoperability is important here, but it is very narrow. We have people working and coordinating our interoperability strategies. *Interoperability doesn't affect the front line guy*. It doesn't affect the front line worker. Interoperability to a frontline officer would mean 'Okay you can flip to this radio channel and communicate with the OPP'. Right now interoperability with officers is limited to pursuits and I don't even know if it is used in that case. The police services are *notorious for being empires* and it is at our own detriment and I have seen that doing joint forces operations, you have to, there is sometimes *difficulties in breaking down the walls to get people to cooperatively work.* But we are getting better by leaps and bounds all the time. The more operations we do jointly, the better we get at working together and I think that the communication and technology will flow from that (*Interview #26, Urban Police Officer*).

For this *Urban* officer, interoperability is not a concern for frontline workers, but instead a concern for those at a command level. The officer further notes that interoperability for frontline workers is limited, but that the organization is continually working to improve this. The officer also recognizes the organizational constraints on information sharing, identifying his agency as an 'empire' unable to work collaboratively with others. The

officer argues that for ICTs to be interoperable with each other, more social interaction and collaborative activity among agencies is needed. More particularly, the officer appears to suggest that it is the social that must lead the technological, a sentiment that undermines ICTs designers' characterizations of technology as bringing people together. Thus, the ideological differences among emergency workers, and more importantly, between emergency ICTs designers and emergency responders has led to an ideological and functional disconnect in the implementation, adoption and use of emergency ICTs.

However, police were not the only social world to hold multiple and varying definitions of interoperability. EMS and the administrators within fire also defined interoperability as something useful at a command level but not for frontline responders. For instance, the *Urban* fire chief stated:

> *Interoperability is a bad word because it can kill people at the operational level* and should only be at the command level. *Interoperability on the scene is the verbal communication and there is no need for the technology to communicate that way* because it creates overload and creates other problems because the language used by firefighters could be alarming and confusing to another agency and vice versa (*Interview # 23, Urban Fire Chief*).

The fire chief also identifies various levels and definitions of interoperability. Of interest in the fire chief's quote is his hierarchical definition of interoperability, with interoperability being valuable for those in a command position (such as himself), but unnecessary and possibly dangerous for frontline responders. Interoperability for the fire chief, therefore, is necessary at a command level, but it is not necessary at the front line level. The multiple and heterogeneous social world ideologies on 'interoperability', I argue, are a leading manifestation of the *ideological* disconnect between ICTs designers'

definitions of the need for and intended use of their technologies, and their defined purpose by emergency responders.

While Chapter Five described emergency ICTs as working to remove the duplication of efforts, create mobile knowledge workers, and maintain emergency responder safety, the present analysis, paradoxically, identifies how the local, situational and organizational use of these technologies can also lead to an opposite effect. Emergency ICTs were not always used to improve or enhance information and communication sharing among police, fire and EMS. Rather, restrictions on access to ICTs coded information became a means for the social worlds to distinguish themselves from the others and aided in processes of their own social legitimation.

As illustrated throughout this chapter, emergency interoperability is not acquired solely through the implementation of ICTs, but occurs through the negotiative labour of communication workers with their ICTs. The fluid, overlapping and central role of communication workers and the important role of boundary objects, specifically emergency ICTs, is outlined in the following quote by an *Urban* EMS communications worker:

> If it is a medium scale incident we will have an incident command post set up, and that is where the supervisor, paramedic team leader, sergeant and captain would liaz together and make their tactical decisions. If it is not an incident that warrants a command site, then they would just talk to each other and communicate through us [the communication centre]. So they would say, 'Call police and ask them'. There is no other way of communicating with those agencies (*Interview #28, Urban EMS Communication Centre).*

As an *Urban* officer also noted,

> Does [interoperability] totally depend on the radio? No, we have done things with the [neighbouring police department] where we are totally interoperable with them and we don't have radio communications. And how do we get around it, we put a police car with two people in it – one person is [the neighbouring police officer] and one is [our Regional] police guy and we call it a quick response vehicle and it goes from place to place (*Interview # 25, Urban Police*).

When these officers require assistance or need to alert their emergency responders, they radio their respective communication centres, who in turn radio the officers. Social order, therefore, is not established and maintained solely through the use of emergency ICTs, but occurs through the interactive and collaborative work of communication workers with their portable radio systems, Computer Aided Dispatch (CAD) systems, Record Management Systems (RMS), and Mobile Data Terminals (MDTs) in ways unintended by the ICTs designers.

Conclusion: ICTs and its Use in the Hierarchical Construction of Interoperability

Emergency ICTs have provided police, fire and EMS with the ability to produce, accumulate, store and exchange information and communicate together. Access to and use of these sophisticated information technologies have become symbols of legitimacy for the different emergency response workers. ICTs designers argue that their technologies: (a) function to connect emergency responders with immediate access to information, and (b) provide the means of communication for maintaining responder safety. This, I argue, is not the entire story. While these technologies provide access to information and provide a means of communicating between agencies, the restriction of

access to information produced by social worlds' organizational contexts also provide them with social legitimation. Indeed, access and restriction of access to ICTs and their coded information are integral to the various processes of distancing, theorizing and standard setting.

Thus, emergency ICTs work to not only acquire and disseminate information, but to also establish and reinforce distinct social world work boundaries. The local, organizational and situational use of these technologies is guided by the various social world ideologies. As noted above, police, fire and EMS hold multiple, and at times contradictory, ideological beliefs about information sharing and emergency interoperability. These differing ideologies, I argue, have led emergency responders to understand the use and function of their technologies differently than ICTs designers intended.

Using a social worlds / arenas framework to analyze the co-construction of social order within a multi-agency emergency response has offered numerous opportunities for understanding the social problem of 'inadequate emergency interoperability' from the *emergency responders' perspective*. From this analysis, I argue that there are multiple and at times contradictory definitions surrounding 'what constitutes information sharing' by police, fire and EMS. Interoperability, therefore, does not hold the same definition and perceived importance across the various social worlds within Emergency and Protective Services (EPS). These varying social world ideologies, I argue, have influenced access to ICTs information and in turn, have created an *ideological* disconnect

between how these technologies were designed to function, and their in-situ application by EMS, fire and police.

Chapter Eight: Contributions, Implications and Qualifications

Introduction

Throughout the preceding chapters, I have argued that information communication technologies such as portable radio systems, Computer Aided Dispatch (CAD) Systems, Records Management Systems (RMS) and Mobile Data Terminals (MDTs) have fundamentally changed emergency responders' work processes. Much of the advancement and implementation of emergency ICTs has been the result of political and public concerns over: (1) A growing need to maintain *accountability* within the workplace through the acquisition and dissemination of *objective* and *authentic* forms of information and knowledge (Berg, 1997; Ericson & Shearing, 1986; Sanders, 2006; Winthereik et al., 2007); and, (2) A growing fear, as constructed and disseminated through mass media, over threats to national security and personal and emergency responder safety (Altheide, 2006; Ericson & Haggerty, 1997; Lyon, 2003b).

Due to the public's fear of future terrorist attacks and emergency communication disruptions, many of these advanced ICTs have been readily accepted and implemented with little reservation and analysis of the actual impact on both emergency responders' work processes, and on society at large (Altheide, 2006). More importantly, little research has been conducted on the ability of these technologies to address the social problem of inadequate emergency interoperability that led to their implementation in the first place.

Emergency ICTs are described by their designers as objective, 'standardized' and user-friendly classification systems that offer emergency responders tight integration and

interoperability among their various emergency counterparts, such as police, fire and Emergency Medical Services (EMS) (see Chapter Five). The present analysis has worked to 'un-black-box' these emergency ICTs by observing what they do, and how different emergency responders define and interact with them. As Lehoux et al. (2004) argue:

> Technology is not simply an assemblage of material features and functions to which varying social meanings can be attached.... technology should be examined in the context of their situated use, wherein more or less robust associations between technical and human components structure social action. (639)

Using contextual constructionism and social worlds / arenas theory, I have assessed the impact that emergency technologies have on the labour of emergency responders in two organizationally distinct Canadian Emergency and Protective Services (EPS).

From this comparative situational analysis, I have uncovered a two-part *critical design-use disconnect* between: (1) how emergency ICTs are designed to function and their in-situ application (*functional disconnect*); and, (2) how emergency technologies are *conceived* and *defined* to be needed by different emergency responders and ICT designers (*ideological disconnect*). The functional and ideological disconnects, I argue, have resulted from: (a) technological anomalies arising from the incorporation of nonhuman actants (such as outside technologies and geographical landscape) and human heterogeneity (numerous workers belonging to various social worlds with multiple needs and uses); and, (b) the various social worlds' ideological and organizational contexts that guide the implementation and use of emergency technologies.

Thus far, I have provided an in-depth analysis of the social relations embedded within the design, use and function of emergency technologies. Although technology is often assumed to be separate from the rest of society (particularly by those who maintain a technological determinist perspective), technology and the construction of technology share much in common with other forms of culture as the very design, implementation and use of technology are patterned by the users' local, situational and organizational contexts.

The present analysis makes four original contributions to our theoretical and practical understanding of: a) the social construction of technology, and b) the impact that nonhuman actants (ICTs, outside technologies and geographical landscape) and human heterogeneity (i.e., private industries and multiple users) have on social worlds' work processes and emergency interoperability. Specifically, this study: (1) Identifies a *functional* and *ideological disconnect* between the design and use of emergency ICTs. (2) Uncovers the multiple, and often contradictory, *definitions of emergency interoperability* held by police, fire and emergency medical services (EMS). (3) Identifies the impact *organizational contexts* have on the function and utilization of emergency technologies. (4) Highlights the *interpretive flexibility* surrounding 'information' and the important role tacit and localized knowledge hold for manipulating ICTs and eliciting emergency response.

In what follows, I discuss each of the four contributions and their significance to our understanding of science and technology studies and emergency preparedness and response. Throughout this discussion, I outline the social implications associated with the

implementation and use of emergency ICTs and areas for future research. The chapter concludes with a critique of the limitations and qualifications of the present study.

Design-Use Disconnect: Uncovering the Functional and Ideological Disconnects

As stated above, the present research makes four original contributions to our understanding of both science and technology studies and emergency preparedness. First, the present analysis provides an original contribution to science and technology studies by uncovering two distinct, yet sometimes reciprocal, design-use disconnects. Throughout the preceding chapters, I have deconstructed the design-use disconnect found within emergency response and identified how it can stem from: (1) a functional in-situ application of the technology, and (2) the guiding social world ideologies in which the technology is embedded. As demonstrated throughout Chapter Six and Seven, both the functional and ideological disconnects can at times be reciprocal, with one leading to or causing the other, while at other times can have little, or nothing, to do with each other.

Although other studies have identified a functional disconnect (see for instance: Lehoux, 1999; Oudshoorn and Pinch, 2003) few have identified how a social world's organizational context and systematic set of beliefs (i.e., ideologies) can lead to a design-use disconnect. Throughout Chapter Seven, however, I uncovered how the varying social world ideologies toward information and communication interoperability have created an *ideological disconnect* between ICTs designers' understanding of the need for, and intended use of, their technologies, and the beliefs and needs of emergency responders. These varying ideological understandings of interoperability, I argue, have led emergency

responders to incorporate and use their technologies in ways that are different from and at times contradictory to their design and original purpose.

Chapter Seven, for example, uncovers two distinct ideological disconnects: (1) between ICTs designers and users, and (2) among the various social worlds within Emergency and Protective Services (i.e., police, fire and EMS). These two ideological disconnects, I argue, have led emergency responders to perceive, define and utilize their technologies in ways that can inhibit information sharing and collaborative action within the social arena of a multi-agency incident. Throughout Chapter Seven, I uncovered how police officers, fire fighters and EMS came to define and perceive the importance of interoperability in various, and at times contradictory, ways. Police, for instance, defined interoperability as the capacity to communicate and share information within a social world (i.e., between police departments), while other social worlds, such as fire, defined interoperability as the ability to communicate and share information across social worlds (i.e, among police, fire and EMS).

This second ideological disconnect among social worlds, I argue, holds important implications for emergency preparedness. Specifically, the ideological disconnect among police, fire and EMS has become incorporated within their work practices and social legitimation processes (i.e., processes of distancing, theorizing and standard setting). The use of emergency ICTs by police, fire and EMS to acquire social legitimation has led to the reinforcement of distinct work boundaries. These distinct work boundaries, I argue, create difficulties and impediments to information sharing and collaborative social arena work processes.

More importantly, the various perspectives toward, and definitions of, interoperability have created a *hierarchical distribution* of information within multi-agency incidents, with particular social worlds (such as police) and organizational ranks (i.e., managers / supervisors) maintaining the greatest access to and control over the dissemination of incident and caller information (see Chapter Seven).

Emergency ICTs, therefore, were not always used to improve or enhance information and communication sharing among police, fire and EMS. Rather restrictions on access to ICTs information sharing became a means for the social worlds to distinguish themselves from their emergency counterparts and aided in processes of their own social legitimation.

Emergency ICTs and the Concern over Inadequate Emergency Interoperability

Second, the present study provides critical insight and understanding into the putative social problem of inadequate emergency interoperability. As described in Chapter One, the driving need for and implementation of ICTs originated from the growing public and media concern over emergency preparedness. Within Canada, concerns over inadequate emergency interoperability have been strengthened through the rhetorical appeals made by police personnel for increased information sharing. Canadian police organizations, for example, made claims that inadequate information sharing prevented an early arrest and apprehension of Paul Bernardo, one of Canada's most notorious serial rapists and murderers. The implementation of emergency ICTs has since

been framed as the solution to inadequate information and communication sharing. As one ICTs designer explains:

> Versaterm's Law Enforcement Information Portal (LEIP) [emergency ICT] brings intelligence information across the geographical boundaries. So if Bernardo were to happen again we could more easily catch him. We could query his name and see if this person exists *anywhere*. So, if I were in Niagara and queried the name 'Paul Bernardo', it would come up as "suspect, sexual assault – Toronto police services". Well, holy crap you know what, 'I should probably talk to the Toronto police department', as opposed to 'No, we should never speak to this person because he hasn't done anything wrong in Niagara, ever'. *(Interview #29, Versaterm Designer)*

While CAD, RMS and MDT technologies have been designed to address public and political concerns over inadequate emergency interoperability, this research has identified an opposite effect. Through my one-on-one discussions and participant-observation with police officers, fire fighters and paramedics, it quickly became apparent that there was no agreed upon definition of 'emergency interoperability'. Furthermore, the level of importance of and need for information and communication sharing varied by social world.

Although ICTs designers present emergency ICTs as the solution to the social problem of inadequate emergency interoperability, the present analysis, paradoxically, identifies that interoperability is not achieved solely through the use of these technologies. Rather, it is through the creative, flexible and intuitive work performed by call-takers and dispatchers with their ICTs that they become capable of modifying standard operating procedures and classifications to initiate and establish collaborative

and collective action. Interoperability, therefore, is not established solely through technology, but also occurs through: (1) face-to-face communications, and (2) the socio-material negotiating labour of communication workers with ICTs.

Organizational Contexts, Emergency ICTs and Negotiative Labour

Third, this study has identified how emergency ICTs are subject to *individual actions* and *organizational contexts* which can change their intended use and function (as defined by ICTs designers) (see Chapter Six). Emergency ICTs have been incorporated within emergency response to act as classification systems that: (a) improve work efficiency; (b) create standardized and objective processes for classifying and prioritizing emergency response; and (c) enhance information and communication interoperability throughout emergency response.

Although emergency technologies have provided emergency responders with access to a vast amount of classified and stored information, the impact of these technologies on work processes are defined differently by the various agencies (police, fire and EMS), as well as by the *Rural* and *Urban* Emergency and Protective Services (EPS). These definitional differences, I argue, result from the various emergency responders' local, situational and organizational definition of emergency ICTs (see Chapter Six and Seven). Technology, therefore, does not hold objective, static and predefined functions, but instead becomes perceived, used and defined relative to the local and organizational context in which it is utilized.

A social world's organizational context, such as geographical work boundaries and standard operating procedures, can lead to technological anomalies that require

emergency responders to perform invisible labour. Within the *Rural* case study, for example, the incorporation of a number of private ICTs companies within policing, fire fighting and EMS created anomalies for technological functioning because: (a) their private licenses made it difficult to integrate different technologies and software; and, (b) the technologies were not designed for the specific work processes and needs of their users, but were instead designed around the 'collective' needs and interests of the companies' vast international clientele.

Designing a piece of technology to operate in a number of different social worlds, with different organizational needs, required ICTs designers to use their own judgment about what technological changes and functions are best suited to their *collective users*. This subjective process by ICTs designers renders emergency responders as the "implicated" and silent actors within the design of emergency technologies. Since the technology is not designed for a social world's particular need, police, fire fighters and paramedics have had to adapt the technology to fit their own organizational requirements (see Chapter Six).

Furthermore, technological anomalies arising from the presence of human heterogeneity and nonhuman actants, I argue, have led to different perceptions of the value and use of emergency ICTs. For instance, many *Rural* emergency responders perceive the use of ICTs as disruptive to work processes, requiring more administrative labour and in many cases leading to a 'duplication of efforts' (see Chapter Six). While *Urban* emergency responders also recognize the increase in administrative duties, they, unlike their *Rural* counterparts, define their technologies as efficient and beneficial for

'risk management' work processes. Emergency ICTs, therefore, are defined by a social world's local, situational and organizational context.

Information, Knowledge and Interpretive Flexibility

Fourth, and finally, by studying emergency responders' everyday interactions, I have uncovered the *interpretive flexibility* surrounding the meaning and relevance of 'information' within emergency response. CAD, RMS and MDT are defined by their designers as classification systems capable of operating across the various social worlds of emergency response. These classification systems compress space and time, making *information* standardized and accessible from anywhere at anytime. The adaptation and use of emergency ICTs has rendered them *authoritative* and *objective* actors, capable of mobilizing and combining emergency responder actions across geographical and organizational boundaries (Latour, 1987b).

Throughout the preceding chapters, however, I argue that the black boxing of emergency ICTs has rendered emergency responders' work processes and, most importantly, their subjective interpretations, invisible. In order for CAD, RMS and MDTs to be immutable mobiles, capable of crossing great distances, the information stored within these classification systems must first be standardized. A central tension, I argue, occurs between the standardized, abstract and static information incorporated within ICTs, and the interpretation and incorporation of this information within the fluid real-time work processes of emergency responders (Star, 1995).

Although emergency ICTs have been designed to provide emergency responders with enough information and, guidance to make 'informed' and 'accurate' decisions,

many of the standardized functions (such as the spatial mapping) have created impediments and disruptions to emergency response. These disruptions can only be overcome through the invisible and negotiated labour of emergency responders. For example, the vast land coverage incorporated within a social world's work jurisdiction, particularly emergency communications, has required communication workers to rely upon their *tacit* and *localized* geographical *knowledge* to operate the technology effectively (see Chapter Six for a detailed discussion). To overcome difficulties posed by the ICTs incorporated standardized mapping system, communication workers have created 'localized' maps (such as maps containing previous street names, local aliases and popular land marks).

The important role of emergency responders' tacit and localized knowledge draws attention to the inability of emergency ICTs to capture, code and disseminate *knowledge*. Through an in-situ analysis of emergency responders' interactions with their ICTs, I have developed insight into the difficulties associated with communicating knowledge and moving it across the various geographical and organizational work boundaries within EPS. I have not only illustrated the tacit nature of knowledge, but I have also demonstrated that "knowledge is localized around particular objects and ends, is embedded in a particular practice, and is invested in a given outcome" (Carlile, 2006: 105).

Emergency ICTs, I argue, do not code and transfer *knowledge* between emergency workers and social worlds, but instead store isolated and abstract pieces of information that only become 'knowledge' as emergency responders incorporate it into

their everyday work processes. By recognizing the conceptual and analytical difference between information and knowledge, the present research uncovers the complex, invisible and interpretive work performed by emergency responders.

Communication Workers as Boundary Workers?

Specifically, this research has identified the important role played by communication workers. Communication workers, I have argued, hold a valuable position within emergency response as they act as the point of connection among the emergency caller and the various emergency responders (i.e., police, fire and EMS). These workers are constantly establishing 'working arrangements' between the various social worlds within Emergency and Protective Services (EPS). They not only fulfill their own informational requirements, but work to satisfy the requirements of their frontline responders and emergency counterparts (see Chapter Seven).

Communication workers, I argue, are fluid entities capable of crossing the many organizational, technological and geographical boundaries present within emergency response. Call-takers and dispatchers, for instance, are the first point of contact during an emergency situation. They not only collect, classify and prioritize the caller's information, but they also act as the point of contact among the caller, frontline responder and various emergency counterparts. In many respects, communication workers facilitate emergency interoperability among police, fire and EMS. It is through communication workers active, negotiated, and often invisible, labour with emergency ICTs (i.e., boundary objects) that collective activity is established (see Chapter Seven).

For this reason, I perceive call-takers and dispatchers as *boundary workers*. As evidenced throughout Chapter Six and Seven, these workers are flexible enough to adapt to both the changing needs of their frontline responders and their social world counterparts. Communication workers, I argue, are *collectively* capable of speaking a common language to manage the numerous codes and classifications necessary to facilitate and initiate collaborative action. While space and time precludes an in-depth analysis of communication workers as boundary workers, the present research suggests that future analysis of the fluid, mediating and negotiated activity of communication workers is warranted and could add much to our theoretical understanding of emergency response, boundary work and boundary objects.

Social Implications: The Case of Function Creep and the Disciplining of Space

While the present research has made a number of theoretical and practical contributions to our understanding of both the social construction of technology and the state of emergency preparedness, it has also drawn attention to a number of important social implications that can arise from the use of emergency technologies. Specifically, the present analysis draws attention to the possibility of technological *function creep,* where the technology designed for one social world takes on a new life and a different function within a different, and possibly unrelated, social world.

Throughout this dissertation, I have argued that emergency ICTs designers describe their technologies using discourses of knowledge and risk management. Much of the designers' rhetoric and discourse presents ICTs as essential for disseminating

coded and classified incident and location-based information. Emergency responders, most specifically police officers, stress the importance of acquiring access to this coded and classified emergency information:

> This is especially so for the handling of major crises where the actions of individual officers need to be coordinated with those of others to ensure that the collective actions taken to address the crisis are efficient, coordinated and effective. (Luen & Al-Hawamdeh, 2001: 312)

However, what is missing within much of the literature on knowledge management, and more importantly, in empirical studies of police work, is an understanding of *how* emergency responders' interpret and use the classified and coded information provided on their ICTs. Knowledge, as I argued earlier, cannot be disseminated strictly via information technologies because the integration of knowledge has an important social component that has both explicit (contextual) and tacit (subjective) dimensions. Instead, ICTs disseminate *abstract*, *contextless* and *static* pieces of information.

I argue that it is through the use of this *static*, *coded* and *transferred information* that emergency ICTs become perceived as tools of risk management. Information technologies, within risk management, are no longer data and information management tools, but become transformed into technologies capable of disciplining and marginalizing people and spaces.

As demonstrated in Chapter Six, for example, both *Rural* and *Urban* police services hold multi-agency partnerships which integrate police, probation, social services and health departments within one searchable database. These technologies, and their incorporated multi-agency partnerships, I argue, have expanded and 'enhanced' criminal

records. At a random traffic stop, for example, an officer can run a query on a person's license plate that not only connects the officer to the Ministry of Transportation database, but also provides him or her access to the vehicle owner's criminal record (see Chapter Six for a detailed example). The information provided on these databases is used by the officer to establish such intangible traits as 'reliability', 'innocence', and 'guilt', even though the past record may be unrelated to the present behaviour of the person being processed. The ability of police to access and interpret outside databases (such as the Ministry of Transportation data base) creates political concern over the potential for abuse of civil rights by police officers.

Thus, the use of emergency ICTs' *coded* and *contextless* information has significant social implications. Like all social creations and endeavors, I am left questioning the accuracy of the information stored in these various databases. As demonstrated in Chapter Six, the initial coding and classification of information involves the selective interpretation by emergency responders. This selective and interpretive process renders both the coding of emergency information and the use of this information for calculating 'risks' an inexact science. For example, the information provided on CAD systems is driven by location addresses. When asked about the accuracy of the stored location based information, a police officer noted that the information *does not move when people move*, but instead is only changed when emergency responders realize that the information is no longer accurate. If organizational resources and individual actions are influenced by this previously recorded (and possibly inaccurate) information, then unintended social implications can arise from its use.

While the information provided on CAD, RMS and MDT does hold merit for emergency responder safety (specifically for informing emergency responders of physical dangers), it is an empirical question how different emergency responders, from various geographical locations and at different times, incorporate and interpret past information to guide their present and future work activities. Although ICTs designers focus on the 'positive' social goals of surveillance for enhancing emergency responder safety and preventing crime, they downplay and minimize the powerful social classification processes that are embedded within, and drive the use of emergency technologies (O'Malley, 1992; O'Malley & Palmer, 1996).

Risk management technologies, such as CAD, RMS and MDTs, I argue, reinforce social classifications, which are often based on suspect profiling. Thus, the central aim of risk management technologies is to act as forms of surveillance capable of socially sorting people and places into predefined categories and classifications (Ericson & Haggerty, 1997; Gandy, 2006; Lyon, 2003b, 2002). How this coded and classified information is interpreted and used by its various users is of critical importance.

Emergency ICTs and their integrated databases, I argue, have the potential to lead to 'function creep', where the technology designed to function for one purpose takes on a new life and a different function both within the social world for which it was designed and, more importantly, in different, and possibly unrelated, social worlds (Curry et al., 2004). The present study, therefore, points to an important area for future research. More ethnographic analyses have to be conducted on policing to fully comprehend how

emergency ICTs, and their stored and classified information, impact and influence the actions of both police officers and police organizations.

The possibility of emergency ICTs heading to 'function creep' transforms their *power* from one of enhancing emergency responder safety into technologies capable of socially sorting people and spaces into social classifications for the purpose of *disciplining* and *marginalizing* bodies and spaces. For example, to those with access to the information database, emergency ICTs have rendered the municipal landscape increasingly legible (Curry et al., 2004).

Curry et al. (2004) were the first to identify how the creation, implementation and use of landscape geographical information systems within emergency response, such as Bell Canada's Master Street Addressing Guide (MSAG), have not only been helpful to emergency responders but have also proved beneficial to outside commercial interests. As Curry et al., argue:

> Just as surveillance processes can be seen in geodemographic practice, in which individuals are typified according to a statistical analysis of various data generated by people as they go about their everyday lives, making purchases, subscribing to telecommunications services, and so on. Here it is possible to associate households, and individuals, with particular locations, and thereby to characterize their actions in a detailed way that defines them as members of particular categories. (2004: 365)

The uses of geographical information databases have transformed and reconfigured emergency responders' understanding of public space. These information databases have led emergency responders to socially categorize, classify and define public space.

Emergency Medical Services (EMS), for example, stressed the benefit of CAD and RMS for completing workplace statistics on calls-for-service. Based on this information, which analyzed the location, priority and number of calls being received over a set period of time, a performance-based deployment plan was developed. Within EMS, there are four established priorities: priority one is a deferrable call (e.g., patient transfer); priority two is a scheduled call (e.g., X-ray pre-scheduled); priority three is an emergency call that holds no immediate threat to life or limb; and priority four is a life threatening emergency call (EMS, 2004). The significance of these priorities, within a performance-based system, is that each priority is associated with a response time target or obligation (EMS, 2002).

The EMS performance-based system, therefore, aims to make staffing and staffing patterns fit with their 'predicted' call demand patterns. Performance-based dispatching, therefore, takes previous caller information stored on CAD and RMS and runs statistical analysis on it to see when, where and what types of medical emergencies have occurred there in the past. EMS then uses the stored ICTs information to reconfigure geographical space to include more than just street names and addresses, but to also include intangible objects, such as perceived medical risks. Areas deemed as 'high medical risks' (including priority three and four's) are then posted as higher priority areas and have paramedics more regularly positioned within them.

The use of EMS coded and classified information, therefore, functions to alter not only work processes but also the configuration and understanding of space. Thus, space is not a naturally inscribed, *objective* concept, but arises through the enfolding of

materiality and subjectivity that works to create a system of orderings (Hetherington, 1997). Within EMS, space becomes wrapped up with the subjective classification of emergency calls and the placement of paramedics and ambulances. The past, therefore, becomes incorporated within and works to guide future actions (O'Malley, 1996; Parnaby, 2006). The constructed 'posting' of ambulances, based on the statistical analysis of 'medical risks', creates a power imbalance throughout the city, which makes some areas likely to receive faster and more efficient coverage, whereas other areas become vulnerable to delays in service.

The present analysis has identified an important area for future studies on emergency response, especially policing, and the impact of 'function creep' on work processes. With the use of emergency technologies becoming more pervasive across society, it is imperative that we identify how these technologies reconfigure and work to discipline space, place and identities. It is here that I hope to focus my future research. Specifically, I want to combine literature from science and technology studies, geography and social worlds / arenas theory to better understand and address how police technologies, specifically Records Management Systems and Geographical Information Systems, reconfigure geographical space and the construction of deviant identities.

Although the present research has identified important areas of future research and has made numerous theoretical and practical contributions, it still faces its own limitations and shortcomings.

Qualifications

The present research, like all research, faced its own social, technological and organizational constraints that worked to influence and shape its overall outcome. Not unlike most doctoral researchers, my research was constrained by departmental deadlines (specifically, the requirement to finish one's doctoral degree within four years) and institutional funding (i.e., the removal of all funding after the fourth year of the doctoral program) which greatly influenced the length of time I was able to stay in the field and analyze my data. If I had not been faced with these organizational constraints, I would have spent more time interviewing and participating in the various social worlds of emergency response. While I stand behind my data analysis, and believe it to be 'reliable' and 'representative' of my participants' experiences, I would have liked to interview more emergency responders within each social world and to spend more time observing them in their everyday work environment.

When I first began this research, I did not realize how complex and difficult the analysis would be. The major difficulty I faced was deciding how to approach this very large topic, and more importantly, how to analyze my data into well-defined and conceptually sound categories. Being unable to find previous research on the collaborative work of police, fire and EMS, I found myself struggling to conceptualize what I saw happening in the field and to frame my data within sociological concepts. There were many moments that I thought it would be better to forgo my original research question and focus instead upon one social world, specifically policing.

Furthermore, due to the size and complexity of the social arena of emergency response, there were a number of interesting questions and themes that arose from my data that I could not feasibly address. Specifically, I would have liked to spend more time analyzing the hierarchical distribution of information within police, fire and EMS. While I demonstrated how unequal access to ICTs and its corresponding information was used by police, fire and EMS to establish social legitimation and distinct work boundaries, I did not have the opportunity to *fully* explore how different social worlds' needs and various organizational positions (i.e., managers vs. frontline responders) become embedded within the design and use of these technologies.

As a future area of research, it would be interesting to see how the various managerial definitions of interoperability within police, fire and EMS become incorporated within a social world's work process and influences access to information and technology. Furthermore, it would be fascinating to see how the managerial definitions of interoperability, and more specifically the need for *frontline* information and communication sharing, impact future social arena policies and standard operating procedures. Before municipalities can create effective emergency preparedness plans, they must first address these questions and fully understand how their police, fire and EMS define and perceive the need for information and communication sharing.

I believe that a more thorough examination of managerial / supervisor access to and control over information sharing could provide greater insight into both the design of emergency ICTs and the state of emergency preparedness in general. Although I do recognize the shortcomings and limitations to this study, I believe that the contributions it

makes to our overall understanding of emergency preparedness and response greatly outweigh any of its shortcomings.

Concluding Thoughts

Everyday we are bombarded by media images and accounts of the loss of our personal and national safety. With this increasing media attention to emergency preparedness, there has been a rise in the creation of emergency preparedness councils and research institutes to address the state of our 'national' security. Governments and local municipalities are continually spending money to implement new technologies to provide citizens with an increased sense of security.

None of these technologies, however, can work if we do not first address the social elements embedded within their very design and use. Instead of spending money and time on designing new functions for the technologies in place, we need to spend that money and time training emergency responders to work together and to use the technological functions already available to them.

As illustrated throughout this research, emergency interoperability is not strictly a technological process, but is instead a socio-materially established and maintained process. Interoperability, therefore, is as much a social process as it is a technological one. Before we can attempt to improve, enhance or repair the putative social condition of *inadequate emergency interoperability,* we must become attentive to both the social and technological elements incorporated and operating within it.

Appendix A: Interview Schedule

What does your job entail within emergency services?

How long have you been working here? What changes have you experienced in your job?

What other members of the emergency response team do you come in contact with throughout your work?

What training did you go through for your job? Is there ongoing training sessions?

How are you informed that there is an emergency, or where do you see yourself within the emergency response network?

Do you train with other emergency workers from the different services, such as fire, police, EMS?

What factors come into play for you when dealing with an emergency (such as do you talk to the caller?

Do you talk to call-takers / dispatchers?

What information do you use when establishing the severity and urgency of an emergency?)

What technology do you use when responding to an emergency?

How do you define 'interoperability'?

Is interoperability important to you? Why?

How does communication interoperability between you and the different emergency agencies, such as 9-1-1, police, fire and EMS impact your work?

What are the strengths and weaknesses of your technologies?

What information is important for you to have in order to respond to an emergency?

What technology do you think is essential for responding quickly and efficiently to an emergency?

Is it important to have information sharing with other emergency agencies?

How do you presently share information?

What is the strength and weakness of this approach to sharing information?

How is caller information shared among all of the emergency responders?

What is the impact of information technologies, such as the computer aided dispatch system and Bell Canada's public emergency reporting system, on sharing information and responding to emergencies?

Could you take me through, step by step, your job during a multi-agency incident?

Assuming that a call has originated from your communication centre, what is your job in responding to a multi-agency call?

Is there anything that you think I have not covered that could be of value for my research on emergency response?

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