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Barriers for Communication and Collaboration in Emergency Response

- A qualitative case-study on operative emergency management in the Sør- and Nord-Trøndelag counties, Norway

Master's thesis in Risk Psychology, Environment and Safety

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Preface

The present master thesis is about operative emergency management. The work with the thesis has been a long journey. Not only has it been a journey in an exciting and demanding theoretical and empirical landscape, but also in a personal manner. The inquiry into the field of emergency management, as well as the application of Grounded theory, has equipped me with substantial knowledge in both a theoretical and methodological sense.

Many people deserve to be mentioned and thanked. First, I would like to thank my supervisor at the department of psychological at NTNU, Professor Britt-Marie Drottz Sjöberg, for comments, inspiring conversations and interesting discussions. Special thanks also to my main academic sparring partner and friend Silje Storsveen for reviews, discussions and inspiration through the writing process; your support has been of enormous value. Dag Otto Skar deserves thanks for being a door-opener that gave me access to the informants in the emergency response organizations. Many thanks also to Per-Ketil Riisem for conducting validity checks on the material. To all informants, thank you for clearing your busy schedules for interviews. Furthermore, thank you Sana Kahn, Kyrre Horpestad Tjåland and Andreas Kiste for your critical voices and constructive reviews.

Håvard Gilja

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Abstract

The present thesis is a qualitative empirical case-study on operative emergency management in the Sør- and Nord-Trøndelag counties, in Norway. The organized response to emergencies often demands the instigation of a variety coordinated actions by multiple organizations and organization levels in order to minimize harm and loss. This work organization often characterizes emergency management. Major events and some types of events demand a scaling up of resources (e.g., materials, personnel, expertise) in both horizontal (more organizations or organizational units) and vertical (crisis management levels) manner. These organizational extensions add new layers of complexity and may introduce or increase problems linked to matters such as decision making, information sharing, procedures, routines, information and communication technology, resource allocation, collaboration, leadership, teamwork, knowledge, trust, etc. Two crucial features for an emergency response system to be well-functioning are communication and collaboration, both intra- and inter-organizationally. The present thesis aims to identify and describe barriers that may limit or hinder effective communication and collaboration within and between emergency response organizations and explores how these two phenomena are affected by horizontal and vertical organizational extensions. Several empirical studies have investigated communication and collaboration within and between the professional emergency agencies (i.e., the police, the fire- and rescue service, and the health service). However, few have explicitly sought to uncover the possible problematic aspects linked to the presence of support- and reinforcement organizations. Therefore, these aspects are given special attention here. Twelve mid-level leaders from six different emergency response organizations have been interviewed. The organizations include three professional emergency agencies (the Police, the Fire- and Rescue Service and the Health Service) and three support- and reinforcement organizations (the Norwegian Civil Defense, the Norwegian Home Guard, and the Norwegian Red Cross Search and Rescue Service). The data analysis identified eighteen communication and collaboration barriers linked to organizational, technological, leadership and individual domains. The discussion dwells on how relevant theoretical perspectives can inform the understanding of the identified barriers and asks if and how barrier reduction or elimination can be done.

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Abbreviations

EA	Emergency agency
EMCC	The emergency medical communication centre
ERO	Emergency response organization
ERS	Emergency Response System
FRS	The fire- and rescue service
HS	The health service
HTO	Human, technology and organization
ICT	Information and Communication Technology
I-P-O	Input – Process – Output
NCD	The Norwegian Civil Defense
NDCPEP	The Norwegian Directorate Civil Protection and Emergency Planning
NDEC	The Norwegian Directorate of Emergency Communication
NHG	The Norwegian Home Guard
NMJP	The Norwegian Ministry of Justice and the Police
NMJPS	The Norwegian Ministry of Justice and Public Security
NNPD	The Norwegian National Police Directorate
NRCSRC	The Norwegian Red Cross Search and Rescue Corps
NSARS	The Norwegian Search and Rescue Service
NSSDS	Norwegian Social Science Data Service
ONR	Official Norwegian Reports
RPD	Recognition Primed Decision Making Model
SAR	Search and Rescue
SRO	Support- and reinforcement organization
SWTMC	Shannon-Weaver Transmission Model of Communication

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1. INTRODUCTION

1.1 Emergency response

The acute management of adverse events often demands the instigation of numerous actions by multiple organizations and organizational levels in order to minimize harm and loss (Janssen, Lee, Bharosa, & Cresswell, 2009). Together, these damage reducing efforts may be viewed as a dynamic structure of functional entities interacting in goal-directing manners which in sum constitutes the responding part of an *Emergency Response System* (ERS) (Bram & Vestergren, 2011).[1] An ERS may be defined as "a socio-technological system that enables preparation for, mitigation of, response to and recovery from emergencies" (Bram & Vestergren, 2011, p. 6).

In major emergencies multiple teams from different organizations must engage in coordinated collaborative efforts. Schaafstal, Johnston, and Oser (2001) therefore denote the overall emergency response as being "a team of teams" (p. 615). The events in need for management vary in type, scale and magnitude and are often characterized by factors such as complexity, uncertainty, and time-pressure (Janssen et al., 2009; Lee, Bharosa, Yang, Janssen, & Rao, 2011; Nemeth, Wears, Patel, Rosen & Cook, 2011). Chen, Sharman, Rao, and Upadhyaya (2007) describe a typical response in the following way:

> "A typical response to a critical incident may involve responders from different functional disciplines and jurisdictions. For a large incident, the response teams may involve the deployment of teams from a variety of local, state, and federal agencies. Each one of these groups brings to the response effort their own culture, values, practices, information systems, objectives, and goals. This heterogeneity often introduces barriers in communication, information sharing, decision making, and operations. Unless properly managed, the barriers may lead to a lack of mutual trust and respect, which are critical to collaboration" (p. 212).

In order to cope with the often complex and dynamic conditions, many interdependent factors need to be in place and to function (e.g., decision making, information sharing, procedures, routines, communication technology, resource allocation, collaboration, leadership, teamwork, knowledge, trust, etc.). Two crucial features for an ERS to be well-functioning are *communication* and *collaboration*, both internally in an organization (*intra-organizationally*),

[1] An ERS is sometimes denoted *emergency management system* (Bram & Vestergård, 2011). ERS will, however, be the preferred term of use in the present thesis.

and with individuals and teams from other organizations (*inter-organizationally*) (Schaafstal et al., 2001; Chen et al., 2007). The present thesis is a qualitative empirical study on perceived barriers related to communication and collaboration in emergency response.

1.2 Emergency response system in societal safety and security

The ERS is an integral part of the wider field of *societal safety and security*. According to the Norwegian Ministry of Justice and Public Security (NMJPS, 2012a) societal safety and security includes protecting the society against events threatening fundamental values and functions, and which poses a danger to life and health. On a fundamental level, societal safety and security consists of two complementary elements: Preventive- and reactive measures (Renn, 2008). The activities of an ERS run through both of these elements (Chen et al., 2007).

Since the end of the Cold War, societal safety and security have received increasing attention both in academia and western societies in general. When the threat from the east ceased to exist, national states turned their attention to civil protection (Bilgin, 2003). This development has further been fueled by natural events such as the 2004 Tsunami in South-East Asia and by intentional acts like the terrorist attacks on the World Trade Center in 2001, and the bombing of Government buildings in Oslo and following massacre at Utøya Island in 2011. In Norway, the growing tendency is reflected in official reports (see e.g., Official Norwegian Reports [ONR], 1998, 2000, 2001; the Norwegian Directorate of Civil Protection and Emergency Planning [NDCPEP], 2007, 2012; the Norwegian Directorate of Health, 2012) white papers on safety and security (see e.g., the Norwegian Ministry of Justice and the Police [NMJP], 2005, 2008) and practical societal safety and security guides (see e.g., the Norwegian Directorate for Emergency Planning, 1994, 2001; NDCPEP, 2003, 2011a), regulations (e.g., Law of Civil Protection, 2010) and established governmental agencies (e.g., NDCPEP, the Norwegian Directorate for Emergency Communication [NDEC], the Norwegian National Security Authority, the Government Emergency Management Council, the Government Emergency Support Unit).[2] [3] In addition, clearer expectations to the authorities on safety and security issues have been formulated (ONR, 2012). Notwithstanding the rising priority of civil protection and emergency planning, the 2011 Terrorist attack on Norway revealed serious

[2] The Ministry of Justice and the Police have later changed its name. From the 1st of January 2012 the ministry has been known as the Ministry of Justice and Public Security (Office of the Prime Minister, 2011)

[3] Due to reorganization the Norwegian Directorate for Emergency Planning was included in new directorate, the NDCPEP, in 2003 (NMJP, 2004).

deficiencies in emergency preparedness. Among the critical issues the official commission of inquiry, the 22nd July Commission, uncovered were a lacking ability to apprehend risk, a failure to implement security measures, deficiencies in coordination and collaboration, inadequacies in communication, lack of updated state of the art information and communication technology (ICT) and ineffective use of existing ICT, and a limited ability to learn from prior events and exercises (ONR, 2012).

1.3 Emergency Response in Norway – A brief introduction

In Norway, emergency response is a joint effort of multiple organizations (The Norwegian National Police Directorate [NNPD], 2011). There exist several collaboration constellations. The largest and most relevant for the purpose the present thesis is the Norwegian Search and Rescue Service (NSARS). Normal or everyday events are usually handled by one or more of the professional emergency agencies (EAs). They include the police, the fire- and rescue service (FRS) and the health service (HS). However, when larger or more demanding events strike additional resources are mobilized. The NMJP (2003) describes the NSARS in the following way:

> "The Norwegian SAR Service is a nationwide effort in which many contribute. All resources – whether national, county, local, commercial or private – suitable for immediate deployment for the saving of lives, are registered, trained and mobilized for duty in a public SAR service. In Norway, "search and rescue service" is an official designation denoting immediate response to an emergency to rescue persons from death or injury. Action to save property, production or the environment is not part of the Norwegian SAR Service's mission, nor is preventive action within its scope of activity" (p. 5).

The fundamental idea is a flexible and cost efficient ERS that can meet the Norwegian demographic and geographic demands. The total emergency response organization may be scaled both quantitatively (i.e., number of personnel and materials) and qualitatively (i.e., type of expertise and equipment) (NMJP, 2003).

In addition to the NSARS, there are several other more specialized collaboration constellations. Examples of areas of cross-organizational collaboration are acute contamination, nuclear disasters, civil – military collaboration etc. A full review of these agreements and constellations is out of scope of the present purpose.

1.4 Aim and purpose

In the present context, the primary aim is to identify and describe barriers that may limit or hinder communication and collaboration within and between key emergency response organizations (EROs) in the Sør- and Nord-Trøndelag counties, Norway. The main focus will be on the operative or sharp end of the organizations and its functioning in land operations. The purpose of the investigation is to get an understanding of the weak points in the system so that measures can be taken to increase efficiency. The thesis, therefore, has more of a practical, than theoretical focus.

Several studies have investigated operative interactions between the EAs (see e.g., Borén, 2012; Berlin & Carlström, 2008, 2011; Haugstveit, 2012; Uhr, Johansson, & Fredholm, 2008). However, less attention has been given to organizations providing operative assistance for the EAs. Therefore, special attention is given to these aspects here.

The operationalization of the aim into a central research question in the present thesis is as follows:

- Which are the main barriers linked to operative intra- and inter-organizational communication and collaboration in emergency response?

In addition, it is of interest to investigate both contextual factors affecting communication and collaboration, and if anything can be done to reduce or eliminate the barriers. Thus, two additional questions were formulated:

- How can vertical and horizontal extensions of organizational structure affect the quality of communication and collaboration in an operative context?
- How can the identified barriers be mitigated or eliminated?

The study is founded on a basic assumption that effective communication and collaboration are prerequisites for successful emergency response (Corbecioglu & Kapucu, 2006).

In order to investigate the chosen phenomena, twelve semi-structured interviews with mid-level leaders from six key organizations have been carried out. Relevant literature from the social and behavioral sciences, with an emphasis on psychology, will be included to inform the inquiry.

1.5 Scope

The scope of the present thesis is limited to the investigation of communication and collaboration barriers in land emergency operations from mid-level ERO leaders' point of view. The ERS under consideration is limited to six key EROs in Sør- and Nord-Trøndelag counties, Norway, and their interactions in an operative context. The barriers may be found in existing communication and collaboration structure and process, but lack of communication and collaboration initiatives in situations where such could be appropriate are also regarded as potential barriers. The scope includes barriers for operative intra- and inter-organizational communication and collaboration between operative personnel in the field, between operative personnel in the field and operative personnel in the EROs' coordination centers, between operative personnel and higher crisis management levels, and between the different EROs' coordination centers. Excluded are, thus, communication and collaboration processes within coordination centers, as well as within the higher crisis management levels.

The main focus will be on larger operations. That is, operations that demand an extension of the normal line management and the inclusion of more EA units (than normal), support- and reinforcement organizations (SROs) (*horizontal organizational extension*), or higher crisis management levels (*vertical organizational extension*).

A basic assumption is that all problematical ERS aspects arise and are maintained in a political and economic context. Such aspects are, therefore, not considered explicitly in the analysis unless the importance of such factors has been especially underlined by informants. Furthermore, it is not realistic to infer that the present barrier identification will unveil all the existing operative communication and collaboration barriers; some factors may not be known or poorly understood. It is neither possible to accurately determine the full range of interrelations among the barriers within the qualitative framework of the present study. Nevertheless, in order to understand the complex interdependency of multiple factors as a phenomenon, it is essential to acknowledge and highlight the systemic relations between elements. Such relations will, therefore, be pinpointed by exemplifications. Finally, it is important to emphasize that learning or improvement is not only related to negative aspects or factors that are in some way perceived to be deficient. Of equal importance are factors that work well, and according to the interviewees in the present study, the ERS in the Sør- and Nord-Trøndelag counties is generally well-functioning. However, as the primary interest here is the factors perceived to be problematic, the well-functioning factors reported by informants have been excluded from the analysis.

1.6 Conceptual clarifications

The following sections will present some main concepts. For central concepts that are not explained here, definitions will be given in the relevant context.

1.6.1 Communication and collaboration

When studying communication it is very important to be precise and explicit about the application of the term. This is because communication is a research area within multiple fields and disciplines, and the term is used in highly varying ways. The term is also debated within psychology, and it has proven difficult, if not impossible, for scholars to agree upon a single definition (Krauss & Fussel, 1996). However, for the purpose of the present thesis Salas, Sims and Burke's (2005) definition of communication is deemed suitable. They define communication as "the exchange of information between two or more individuals irrespective of the medium" (p. 567). From this definition, it is evident that communication may take many forms including verbal language, body language, written language, and various types of signs and symbols. It also follows that the informational exchange may both be face-to-face or through the use of various ICTs. In emergency response acts of communication are often highly purpose driven (Rotanz, 2007), the overall goal being solving the mission and bringing an end to the emergency.

Communication is closely related to the other concept of interest, collaboration. Collaboration may be defined as a complex phenomenon where two or more actors work to achieve shared aims and objectives (Fewster-Thuente & Velsor-Friedrich, 2008). As a goal-directed enterprise, collaboration, here, must be viewed in relation to the overall goal of emergency management (i.e., to limit and minimize the harm caused by an adverse event) in that it includes all common intra- and inter-organizational response phase actions, both those carried out within teams and by teams in parallel. In other words, collaboration is not only limited to seamless cooperative acts, but, in line with Berlin and Carlström (2011), collaboration "may consist of everything, from simple forms of exchange to prestige-less and seamless integration" (p. 161).

From this perspective on collaboration, communication becomes a means for collaboration. Therefore, it follows that factors that influence communication also influence collaboration.

1.6.2 Barrier

The concept of *barrier* is used in different ways in the scientific literature. In the safety literature, the concept has a prominent place and have traditionally denoted physical measures that exist in a system in order to hinder failures or accidents from happening (e.g., crash fence, fire door) (Sklet, 2006). In later years, the concept has evolved to include also a wider range of measures including aspects such as safety policies and event reporting (Hollnagel, 2004). Independent of the exact way of appliance, the main thing to note is that a barrier is a component that exits to prevent something negative from happening. In the present thesis, the concept will be used in an inverse way. Here, barrier denotes a hindrance which limits or hinders something positive and wanted; in this case, effective intra- and inter-organizational communication and collaboration. More specifically, a barrier is defined as any factor that may limit or hinder effective communication and collaboration within and between EROs. This conceptualization is more in line with how the barrier concept is used in environmental psychology, where barriers are viewed as all matters that may limit or hinder a given pro-environmental behavior (e.g., recycling, energy conservation, energy efficient investments) (see e.g., Blake, 1999; Kollmuss & Agyeman, 2002; McKenzie-Mohr, 2000).

1.6.3 EROs and operative personnel

Organizations with a possible role in emergencies may be categorized in various ways. For instance, Bram and Vestergren (2011) separate between *professional first responders* (i.e., the professional emergency agencies), *lay first responders* (i.e., the non-professionals) and *bystanders* (others, including mere observers). Drawing on earlier work by Dynes and Quarantelli (1977), Rotanz (2007) provides a more specific taxonomy distinguishing between four types of organizations: *Established organizations*, *expanding organization*, *extending organizations*, and *emergent groups*. Established organizations are organizations that maintain their basic organizational structure and routinely respond to emergencies, such as the Police, the FRS, and the HS (i.e., the EAs). Expanding organizations are characterized by having routine tasks in emergencies, but the limited everyday organization needs to be scaled-up by mobilizing personnel. In Norway, such organizations include the Norwegian Civil Defense (NCD), the Norwegian Home Guard (NHG), Norwegian People's Aid Health and Rescue Service (NPAHRS), the Norwegian Red Cross Search and Rescue Corps (NRCSRC), etc. The third category of organizations, extending, are organizations that do not have routine tasks, but maintain their basic organizations during emergencies. These may be exemplified by construction companies that are mobilized to remove debris. The last category, emergent

groups have no formal structure or tasks but represent groups of varying sizes that collectively respond to an emergency or crisis. Farmers that use their tractors and manure spreader to mitigate a wild fire are an example of this category. The organizations participating in the present study belong to the first two categories, the established organizations and the expanding organizations. Here, EROs will be used as a common term for both these categories. However, for the purpose of the present thesis, established organizations will be referred to as the EAs, and expanding organizations will be termed SROs. By using this terminology the SROs' support and reinforcement role is underlined (i.e., a matter that is important in relation to the purpose of the investigation).

In both types of organizations, there are divisions composed of operative personnel. Operative personnel are here defined as all personnel in EROs that may have a sharp end role (i.e., here, at coordination centers or in the field) in emergency situations. Operative personnel are often part of operative teams, which collectively constitute operative divisions. Operative divisions are the practicing parts of a given organization (Eid, Johansen, & Laberg, 2006). An operative leader is in charge of all operations, and exercise command and control over his or her personnel (Eid, Johansen, & Laberg, 2006).

1.7 Contextualizing emergency response

1.7.1 Emergency, crisis and related concepts

The literature on emergencies, crisis and related phenomena (e.g., incidents, accidents, disasters, catastrophes, etc.) is vast and multi-disciplinary, and there are disputes regarding how these concepts should be defined (Rotanz, 2007).[4] Norwegian official documents often refer to the term *crisis* and use this to denote a wide range of phenomena. Identifying characteristics include surprise, lack of control, potential loss of vital interests, involving multiple actors, time-pressure, breakdown in regular decision-making processes, a focus on short-term solutions, uncertainty, lack of information, large interest from third parties (NNPD, 2011). These characteristics often overlap with those of an *emergency* (see e.g. Chen, Sharman, Rao, & Upadhyaya, 2011), but emergency is often used to denote cases that have a smaller impact than crisis (Hoetmer, 1991). Merriam-Webster Online Dictionary define

[4] See for instance Rotanz (2007) for a more detailed review of these concepts.

emergency as a relation between a surprise and action, or more specifically, "an unforeseen combination of circumstances or the resulting state that calls for immediate action".[5]

In the present thesis, emergency will be the preferred term. However, the term will be used in a more pragmatic and unspecified manner than in the definition above; all events independent of their size or scope will hereafter be denoted emergencies. That is, instead of referring to different categories of phenomena (e.g., crisis, incidents, etc.), event characteristics (e.g., complex, uncertain, type, time-pressure) will be specified when relevant. This is done in order to avoid confusion, and because the main issue of interest here is not the event per se, but communication and collaboration as emergency management processes. Therefore, it is more concise and appropriate to specify event characteristics that may affect these phenomena, than referring to generic event categories

1.7.2 Phases of emergency management

It is common to view the emergency management as a process consisting of different phases (Chen et al., 2011). Boin and McConnell (2007) apply five phases: *Prevention*, *planning*, *acute response*, *recovery*, and, *evaluation*. This model is one of the most widely accepted and applied frameworks in the crisis research community (Boin & McConnel, 2007). In contrast to this model, Chen and colleagues (2011) account for three phases: *Pre-incident*, *during-incident*, and *post-incident*. The Norwegian police also include three main phases: Preparation phase, execution phase, and follow-up work phase (NNPD, 2011). Despite some varying terminology, the phase of primary interest here is the response phase (i.e., acute response [Boin & McConnel, 2007], during-incident [Chen et al., 2011], execution phase [NNPD, 2011]), which is recognized as a distinct phase in all three models. The response phase here denotes the distinct time-period in which various actors engage in operative activities aimed at limiting and minimizing harm caused by an adverse event.

1.8 Structure

This thesis is structured in seven main chapters. The next and second chapter will outline the thesis' theoretical framework and addresses the thesis' theoretical point of departure (The human, technology and organization perspective), communication, collaboration, leadership, stress, and the role of preparatory measures in emergency response.

[5] http://www.merriam-webster.com/dictionary/emergency

The third chapter presents an overview of the case under scrutiny. Included are a brief description of the participating organizations, operative integration of organizations during response, and an outline of Norwegian principles for emergency- and crisis management.

The fourth chapter addresses the thesis' methodology. The chapter consists of four main parts: Design, data collection, data analysis, and, reliability and validity. Ethical consideration specific to each main phase of the research process will be addressed in the end of the three former parts.

Chapter five presents the empirical results generated through the analysis process. The chapter provides an overview result table as well as a detailed review. Chapter six is composed of two parts: Case discussion and general discussion. Chapter seven contains the conclusion.

2. THEORETICAL FRAMEWORK

The present chapter will present a theoretical framework relevant for the thesis' research questions. In order to provide a general framework for investigating and understanding the barriers for communication and collaboration, the chapter starts with a review of a systems perspective and how this is related to ERS'. Insights from this literature will be used to illuminate the multiple factors and interrelations that can influence response phase performance. Then, after a section on ICT systems, the presentation will outline communication in emergency response both on an organizational and interpersonal level, before taking a broader perspective when reviewing literature on collaboration. The subsequent sections will then explore the role of leadership and decision making. After the phenomenon of stress has been reviewed in an emergency response context, the chapter ends with a more general section on the role of preparatory measures.

2.1 Theoretical point of departure: Humans, technology and organization

An ERS can be viewed as a complex socio-technical system composed by human, technological and organizational components. The field that studies how interaction between such components can affect system performance is known as *human factors*.[6] The field of human factors has traditionally been preoccupied human error, or more specifically, designing systems that account for human fallibility (Saus & Johnsen, 2006). The HTO-perspective (see figure 2.1) is one widely known and applied human factors perspective (Berglund & Karltun, 2007).

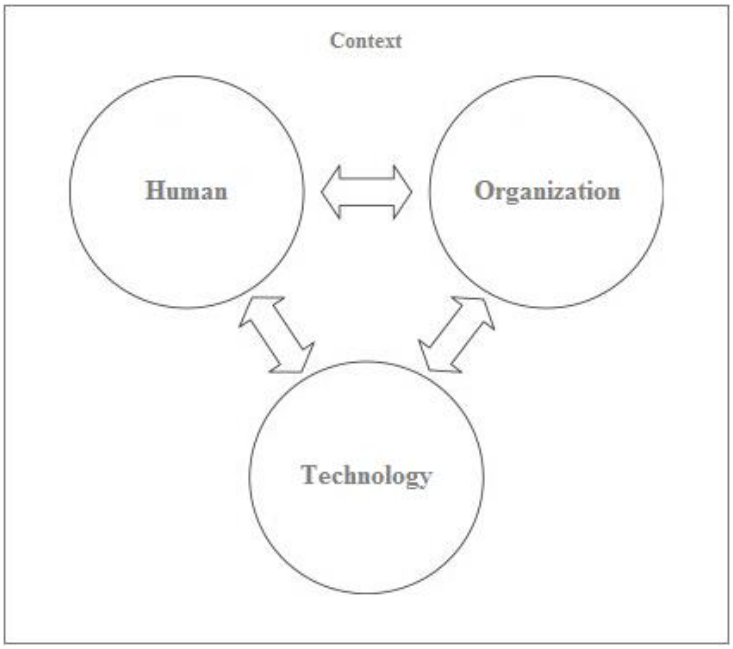

Figure 2.1 System interrelations between HTO-components (adapted from Berglund & Karltun, 2007).

Although the HTO-model has its roots in the systems perspective (see e.g., von Bertalanffy, 1968; Checkland, 1981), the model originated in the nuclear power industry in the 1980 as a means for safety improvement. Later

[6] The concept "human factors" originated in the U.S. The European version of the same concept is known as *ergonomics* (Saus & Johnsen, 2006).

its scope and practicability has widened to become a meta-concept for analyzing and understanding "highly complex work activities" (Berglund & Karltun, 2007, p. 161). Examples of such activities are running of trains and aircrafts, oil drilling, etc. The first component, *human*, consists of factors that are strictly human and which are considered important for task performance (e.g., skills, knowledge, experience, individual relations). The second element, *technology*, simply means the technical system (e.g., radio communication system, assembly line, etc.). The final component, *organization*, denotes both the formal and informal organization and work structure (Westlander, 1999, cited in Berglund & Karltun, 2007). Such factors include for instance job definitions, responsibilities, hierarchical positions, policies, goals, strategies, rules, procedures, and culture. The three HTO-components are often divided into more detailed sub-parts (see e.g., Daniellou, 2001; Berglund & Karltun, 2007). A macro-level orientation serves the present purposes because here the HTO-perspective will not be applied in a strict sense, but rather serves as a general framework that aids the understanding of where the barriers for communication and collaboration may be located and how they may interact. The "systems lens" of the HTO-perspective takes the totality of a system dynamic interactions into consideration (in section 1.5 the system under consideration here was defined as selected EROs in Sør- and Nord-Trøndelag counties, Norway, and their interactions in an operative context). A systems perspective is thus a helpful tool for investigation, comprehension and design improvement of an ERS' (Bram & Vestergren, 2011). From the HTO viewpoint, communication and collaboration becomes processes that influence system performance.

2.1.1 Reason's organizational perspective

In his book, *Managing the Risks of Organizational Accidents* (1997), James Reason points to how accidents and human failures must be understood in a broad perspective. Reason's (1997, 2000) organizational accident theory was originally developed in order to investigate or understand large accidents (e.g., plane crash, train accidents, gas blowouts, etc.). However, Reason's (1997, 2000) broad perspective can inform any investigation that is preoccupied with operative error and systems malfunctioning (in the present case communication and collaboration barriers relevant for ERS functioning in the response phase of emergency management).

Reason notes that high technological systems may have many defensive layers, but that the layers have holes that "are continually opening, shutting, and shifting their location" (Reason,

2000, p. 769). One or more open holes can permit hazards to lead to losses through enabling "a trajectory of accident opportunity" (Reason, 2000, p. 769). Reason (1997, 2000) denotes this model *the Swiss cheese model* (see figure 2.2):

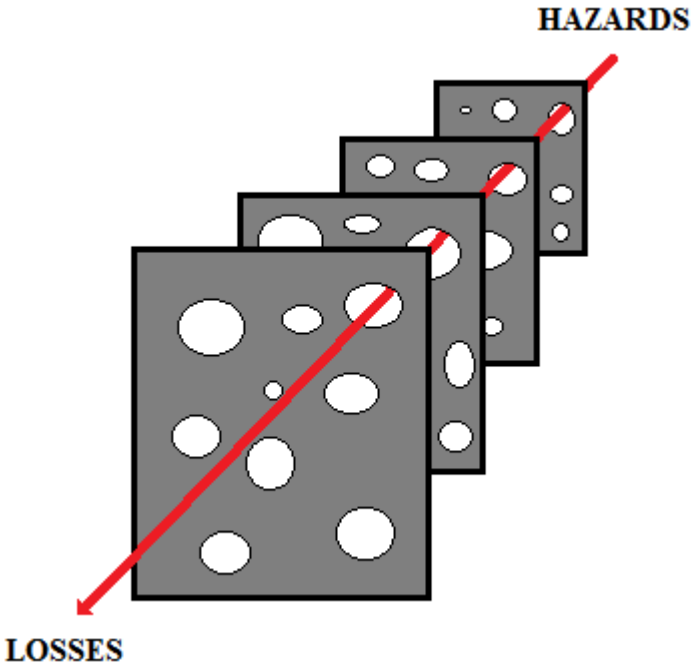

Figure 2.2 The Swiss cheese model (adapted from Reason, 1997, 2000). The red arrow illustrates how hazards can penetrate a system's defensive layers and lead to losses.

Reason suggests two terms for capturing factors (i.e., holes in the Swiss cheese) that lead to unwanted events: *Active failures* and *latent conditions*. Active failures denote the unsafe acts committed by personnel in the system's sharp end (e.g., mistakes, slips, fumbles, lapses, procedural violations). Latent conditions involve factors that do not necessarily have immediate adverse effects, but rather may have such consequences by existing as weak points in the system (e.g., decision made by higher organizational levels and system designers, poor training, inadequate tools and equipment, poor procedures). According to Reason (1997), latent conditions are properties of all systems, and are prone to produce unwanted events over time. The latent conditions may have two different types of adverse effects (Reason, 2000): They may provoke errors (e.g., time pressure, inadequate equipment, inexperience, understaffing, fatigue, etc.), or they may represent weaknesses in the system (e.g., untrustworthy alarms, design deficiencies, unworkable procedures). Thus, it is many times the combination of factors that cause the negative effect. That is, active failures combine with local circumstances (i.e., situational factors) and latent conditions (Reason, 1997).

The concepts active failures and latent conditions are compatible with the HTO-perspective. While active failure is limited to the human dimension, latent conditions may be both technological and organizational. Thus, when Reason's concepts are combined with the HTO-perspective, errors can be viewed as a part in an event chain that is composed of humans, technological and organizational elements.

2.2 Communication

Communication is crucial for effective management of emergencies (Crichton & Flin, 2001). Individuals, teams, and organizations must be able to exchange information and understand other's messages and intentions in order to collaborate (Comfort, 2007). One of the primary goals of the communication processes in emergency situations is to transfer decision making premises from one actor to another (Dynes & Quarantelli, 1977). In addition, warnings need to be conveyed, resources ordered, risk assessments made, etc. In major emergencies communication often involves a complex multi-level enterprise of vertical, horizontal and diagonal communication lines of both formal and informal character (Bram & Vestergren, 2011). Research on communication in these situations (especially crisis situations) has made scholars claim that as much as seventy to eighty percent of all problem solving activities involve some form of communication (Weisæth & Kjeserud, 2007). Consequently, if communication does not function properly communication breakdown and general loss of efficiency may be the result (Wilson, Salas, Priest, and Andrews, 2007).

A variety of different models and theories of communication have been proposed. The next section reviews an early and influential information theory model of communication which will serve as a departure point for the subsequent chapter sections.

2.2.1 Shannon-Weaver Transmission Model of Communication

In the introduction chapter communication was defined as "the exchange of information between two or more individuals irrespective of the medium" (Salas, Sims, & Burke, 2005, p. 567). This definition can be traced back to the Shannon-Weaver Transmission Model of Communication (SWTMC; Shannon & Weaver, 1949; see figure 2.2). The SWTMC stems from information theory and was originally developed for technical purposes (e.g., radio communication) but has later been applied as a means for understanding human

communication (Krauss & Fussel, 1996).[7] Shannon and Weaver (1949) propose that five components are necessary for successful information transmission: (1) An *information source* to produce a message, (2) a *transmitter* (sometimes called encoder) to enable encoding the message into signals, (3) a *channel* that adapts the signals for transmission, (4) a *receiver* (sometimes called decoder) that can decode or convert the signal into a message, and (5) a *destination* for the message to arrive. In order to make information transfer possible, a shared system of signs and rules for encoding and decoding is crucial (e.g., common language) (Shannon and Weaver, 1949).

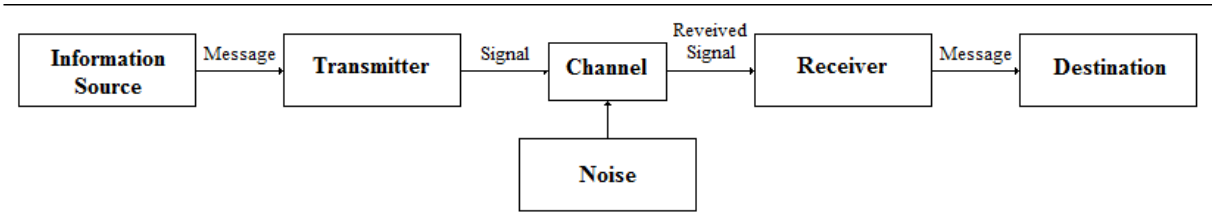

Figure 2.3 The SWTMC (adapted from Shannon & Weaver, 1949).

According to the SWTMC, the signals have a specific purpose or function: Reduction of uncertainty (Shannon & Weaver, 1949). That is, the informative quality of a message is determined by whether the destination is less uncertain after the message is received than it was before. Further, the quality of the message reception is set by three determinants: Type of channel, the channels capacity and level of noise (Shannon & Weaver, 1949). The SWTMC has later been elaborated by other scholars (see e.g., Barnlund, 2008; Schramm, 1954), but the SWTMC should serve the purposes of the present thesis.

2.2.2 Signs and symbols

In order to understand communication in more detail, there is a need to distinguish between signs and symbols. A symbol is a "signal (behavioral or otherwise) that stands for, or signifies, something other than itself" (Krauss and Fussel, 1996, p. 657). The meaning of a symbol is dependent on social convention. That is, for a symbol to be communicable there must be a community of at least two individuals that agree that the given symbol signifies the thing that it is supposed to signify. A sign differs from a symbol because of the intrinsic cause and effect relationship between the sign and what it signifies. Krauss and Fussel (1996)

[7] When applied on human communication the SWTMC has been denoted "The Encoder/Decoder Model" (Krauss & Fussel, 1996).

exemplify a sign with blushing, and in causal terms the blushing is an intrinsic effect of the physiological response to embarrassment and similar situations. In contrast to blushing, saying "I am embarrassed" is the same phenomenon expressed through symbols (i.e., here, words). Another distinguishing feature between signs and symbols is that symbols are usually used in an intentional way while signs for the most are involuntary (Krauss & Fussel, 1996). However, the distinction between symbols and signs is sometimes blurry. Signs can be used symbolically (e.g., crying as a means to an end), and symbols can function expressively (e.g., slips of tongue). Krauss and Fussel (1996) therefore state that it may be more useful to "think of signs and symbols as representing two poles of a continuum rather than discrete categories" (p. 660).

2.2.3 Information and communication technology

Fed by the general ICT progress the last decades, we have witnessed an explosion of both hardware and software solutions for supporting emergency response (for a review of various ICTs see e.g., Bram & Vestergren, 2011). ICT aims at effective gathering, processing, distribution and mediation of information (Woltjer, Lindgren, & Smith, 2006). Today there are solutions available that support a variety of media. Examples of ICTs that are used in emergency management include mobile phones, GPS, analogue and digital radios, computers, broadband, display, etc. The need for good solutions for ICT primarily arises whenever there is some degree of physical space between the collaborating actors, and when information needs to be transferred. Woltjer, Lindgren, and Smith (2006) refer to such collaboration as *distributed work* (i.e., in contrast to *collocated work*). However, personnel may benefit from ICT even when they are collocated (i.e., displays for information sharing) (Bolstad & Endsley, 2000).

Independent of the type of ICT used in distributed work, its ability to support both intra- and inter-organizational communication depends on some general basic qualities.[8] Generally, the ICT infrastructure needs to be robust enough to handle strain (e.g., weather conditions, solar storms, system overload) (Banipal, 2006) and have sufficient coverage (Bram & Vestergren, 2011). When the ICT system breaks down, or there is a lack of coverage, communication may be seriously disrupted (e.g., by being unable to contact the coordination centre and coordinate

[8] Note that the basic ICT qualities necessary for effective distributed work are closely linked to the components and transmission process of the SWTMC. For instance, limited interoperability involve incompatibility between the transmitter and the receiver; the receiver cannot decode the signals.

operations etc.). Another important ICT factor is interoperability of communication (Comfort, 2006; Jungert, Hallberg, & Hunstad, 2006; Bharosa, Lee, & Janssen, 2009). That is, ICT systems compatibility across organizational boundaries. Research has shown that incompatible systems may be highly problematic for inter-organizational collaboration. For instance, in the response effort following the 9/11 terrorist attack in New York, lack of interoperability decreased operations effectiveness (Comfort, 2006). Moreover, net capacity is a relevant quality; the system must have a capacity to allow multiple net-users within a given area (DNEC, 2007). Furthermore, user friendly design of artifacts is another ICT aspect that has been highlighted as important for effective communication (Woltjer, Lindgren and Smith, 2006).[9] In addition to these basic qualities, there are also other ICT system specific qualities. For instance, for a system that relies on verbal communication, the speech quality is very important (DNEC, 2007). Displays for information sharing have also been highlighted in the literature. Such can be exemplified by displays that allow an informational support system providing a *common operational picture* among commanders (Norros, Colford, Hutton, Liinasuo, Grommes & Savioja, 2009).[10] Such artifacts must be designed on the basis of an understanding of the limits of human cognitive abilities (Engelbrecht, Borges, & Vivacqua, 2011).

Having outlined the role of ICT systems for ERS effectiveness, the review will now take a look at communication and collaboration in an organizational perspective.

2.2.4 Organizational communication

Organizational communication will here be outlined in a sociological network perspective. This is done in order to provide an understanding of the macro relations of communication in emergencies. An ERS is usually composed of multiple organizations, in Norway exemplified by the NSARS. However, within an operative ERO there are usually also several management levels (see section 3.3.3). In an organizational perspective communication may be defined as "a process through which an organization sends a signal or message over a channel to another part of the organization (intraorganizational) or to another organization (interorganizational)" (Dynes & Quarantelli, 1977, p. 2). The nodes (i.e., the organizational parts and other

[9] *Artifact* may be defined as "a device used to carry out or facilitate a specific function that is part of work" (Hollnagel & Woods, 2005, p. 66).

[10] A common operational picture is a (physical) representation of the status of operations (Norros et al., 2009). The concept is closely linked to the concept of situation awareness which will be addressed in section 2.3.5.

organizations) and their connections make up a communication structure. For communication to work efficiently in emergency situations, adequate links between levels and organizations need to be established (Dynes & Quarantelli, 1977). An obvious example of such a link is an interoperable ICT system. However, functioning communication networks (i.e., relations) also needs to be established prior to response (Kapucu, 2006).

2.2.5 Interpersonal communication

Earlier the SWTMC (Shannon & Weaver, 1949) was reviewed, and it was stated that the originally technical model had later been applied to human communication. This adjustment in scope has, however, been shown to be problematic. Krauss and Fussel (1996) point out, although simple and appealing, the SWTMC cannot account for the complexity involved in human communication. One obvious criticism is that the model is linear. Human communication clearly is more complex. Secondly, it would also be wrong to confuse the information transmission with the transmission of meaning. That is, a code as a bearer of meaning. Other elements also matters for the interpretation of a message. Examples of such elements are paraverbal cues, intonation, non-verbal cues, power relations, and situational context (Krauss & Fussel, 1996). Theories and models that are rooted in a psychological perspective on human communication seek to account for these factors, and take more micro-oriented perspective than the sociological approach previously addressed. Apart from the factors already mention, psychological communication models may include aspects such as personal characteristics, information processing in the brain, social context (e.g., social relations, status, liking, social distance, etc.), trust in information sources, etc. Due to quantitative limitations and the scope of the present thesis not all such factors will be reviewed here. However, some main factors that may be relevant for operative emergency work will be addressed.

Lyons (1977, citied in Krauss & Fussel, 1996) provides a comprehensive account of six generic contextual factors that affect communication: (1) The communicators' roles in the conversation (speaker, addressee), the communicator's social roles (e.g., doctor, patient) and their social status, (2) the place and time of the interaction; (3) degree of formality of the situation; (4) the appropriate style of speech (e.g., command style, literary, casual); (5) the topic of conversations, and (6) the situational domain (e.g., home, work). In an operative setting, factors such as these can clearly affect the quality of communication. For instance can differing social status be an element that degrades communication (Cosby & Croskerry,

2004); the lower status personnel may resist questioning decisions taken by the higher status leaders even though they believe it to be erroneous.

2.2.5.1 Requirements for clear communication

Scholars have also developed general normative models of how to communicate clearly. Grice (1975) provides a generic comprehensive model, *the Cooperative Principle*. The Cooperative Principle states the following: "Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged" (Grice, 1975, p. 45). The Cooperative Principle contains four basic rules called *Conversational Maxims*. The Conversational Maxims are shown in table 2.2.

Table 2.2 Grice's Conversation Maxims (Source: Krauss & Fussel, 1996, p. 665).

Maxims of conversation	
1.	**Quantity**
a.	Make your contribution as informative as is required (for the current purposes of exchange).
b.	Do not make your contribution more informative than is required.
2.	**Quality**
a.	Do not say what you believe to be false.
b.	Do not say that for which you lack adequate evidence.
3.	**Relation**
a.	Be relevant.
4.	**Manner**
a.	Avoid obscurity of expression.
b.	Avoid ambiguity.
c.	Be brief (avoid unnecessary prolixity).
d.	Be orderly.

The Conversational Maxim is in no way specific to operative settings, but most elements are clearly relevant. The exception is maybe the 2b element "Do not say that for which you lack adequate evidence". In events that involve high levels of uncertainty, it may prove difficult, and maybe also be wrong always to gather solely adequate evidence. That is, acting on lacking information may be better than not acting at all.

Wilson and colleagues (2007) suggest a framework specific for obtaining clear and effective communication in operative team settings. According to them, three factors are essential for

enabling effective communication: *Information exchange*, and *phraseology*, and *closed-loop communication*. The first factor, information exchange, is a multi-faceted concept that includes what information that is passed between the sender and the receiver, and highlights the use of all available information sources, proactive transference of appropriate information to the right person (i.e., before the information is requested), and updating other relevant collaborating individuals or units on the big picture of operations (Wilson et al., 2007). Examples of relevant information that may need to be passed are situational updates (e.g., tasks, environmental), changes in the mission, performance feedback, etc.[11] Bharosa and colleagues (Bharosa, Lee, & Janssen, 2009; Bharosa, Janssen, & Tan, 2011) claim that problems in emergency response are often related to the collection and distribution of information. For instance, in a study of field exercises, the researchers found that response personnel were often more preoccupied with getting information provided from others than with transferring information to others who may find it beneficial (Bharosa, Lee, & Janssen, 2009). Similar problems have also been noted by Lundberg and Asplund (2011). They found that personnel were uncertain about other's informational needs and that communication was thought to be time-consuming. The latter was especially the case during periods of high workload. These examples highlight the importance of adequate information exchange. The second factor, phraseology, denotes "how information is delivered between the sender and receiver" (Wilson et al., 2007, p. 5). Effective phraseology can be sought through the use of proper terminology, the avoidance of excess chatter, by being as brief as possible, and the completeness of standard reports (Wilson et al., 2007). Problems related to phraseology were also noted by the Norwegian Directorate of Health's review of the HS's response to the 22/7 terrorist attack (The Norwegian Directorate of Health, 2012). For instance, the problems involved different interpretations of on-scene leadership terms (i.e., medical scene commander and ambulance scene commander) and the diverging terminologies used to denote the levels of crisis management. The last factor is linked to meaning. That is, was the message's meaning correctly received and interpreted? A communicational procedure that is often applied to assure correct understanding is called closed-loop communication. Closed-loop communication involves three sequential steps: (1) The message is transmitted by a sender (2) the acceptance of the message by the receiver by a read-back of the messages content (3) verification from the sender that the receiving and interpretation are in line with

[11] Note that this communication includes both verbal and nonverbal information exchange.

the intentions (Wilson et al., 2007). Research has shown that closed-loop communication is critical for effectiveness of collaboration in operative teams (McIntyre & Salas, 1995).

2.3 Collaboration

Collaboration in emergency response is a process that happens on several levels (i.e., organization and team). Recall that collaboration was defined as a complex process where two or more actors interact in order to reach a common goal (Fewster-Thuente & Velsor-Friedrich, 2008). Further, collaboration may occur both in a distributed and collocated manner (Woltjer, Lindgren, & Smith, 2006). Examples of distributed work in operative emergency management are the interactions between the coordination centers, and between coordination centers and field units. Such collaboration often involves extensive communication, and coordination of units and resources are important objectives (Comfort, 2007). The following sections will review collaboration both on the organization and team level. First, however, some fundamental collaboration supporting factors will be addressed.

2.3.1 Coordination of resources and organizational awareness

In order to handle major events, the total emergency organization needs to be scaled up (Oomes, 2004). There are several types of resources that the EAs may need in emergency situations. Jungert, Hallberg, and Hunstad (2006) account for three categories of resources: Reinforcements from similar organizations (e.g., when a police districts' resources are deemed inadequate, and assistance from a neighboring police district is requested), external materials or expertise not possessed by the EAs (e.g., when an alpine rescue team is needed to save a person stuck in steep terrain, material support, etc.), and information available through external organizations (e.g., when the FRS needs building plans). In addition to these categories, the mobilization of additional personnel from SROs organizations and, for the daily EA line management, mobilization of the higher crisis management level (i.e., strategic, operational, tactical) may also be considered as additional resources (for a review of crisis management levels in Norway see section 3.3.3) (NNPD, 2011).

In order to allocate and coordinate resources efficiently, the organizations need to be aware of each other's units and their capabilities. Oomes (2004) denotes this type of knowledge *organizational awareness*. When the different emergency organizations are unaware of available resources, the result may be problems in coordination, communication, and collaboration (Oomes, 2004). Hollnagel and Woods (2005) points to the importance of timely

resources and states that lack of resources is a key factor that may lead to loss of control. Lack of resources may both be the result of acute conditions, such as information overload or a consequence of a systemic failure (e.g., a mistake at the blunt end or a latent condition) (Hollnagel & Woods, 2005).[12]

2.3.2 Trust

Several scholars highlight the importance of trust in emergency response operations (Kapucu, 2006; Kapucu, Arslan, & Demiroz, 2010; Lundberg & Asplund, 2011). Uhr, Johansson, and Fredholm (2008) view trust as a latent system condition that influences the manifestation of organizational tasks and structures. In a collaborative emergency response setting the concept may be considered on two separate levels: The team and the organization. The present section focuses on the organizational level (see section 2.3.4.1 for the role of trust in teamwork). Relations developed prior to the actual emergency response (i.e., through daily collaboration) serve to build trust, decrease cross-sectional boundaries and thus tie together organizations (Kapucu, 2006). Kapucu (2006) further underlines that trusting networks of relationships between organization can best be built prior to emergency situations. Important factors for building trust in this phase (i.e., preparation phase) involve a willingness to collaborate, information sharing and a set of shared values (Kapucu, 2006). However, even though trusting organizational relationships are important for inter-organizational collaboration, Kapucu, Arslan, and Demiroz (2010) state that interdependency among organizations can serve to increase the likelihood of successful collaboration even if trust should be lacking and serve as a foundation for building trust.

2.3.3 Boundary spanners

In section 2.2.4, organizational communication, the importance of pre-established networks between organizations was stressed (Kapucu, 2006). In order to decrease boundaries between organizations, personnel in EROs may serve as *boundary spanners* (sometimes called liaisons). The boundary spanner role may be both formal and informal, but the main function is to facilitate inter-organizational collaboration with emphasis on the exchange and sharing

[12] Stanovich (2006) defines *information overload* as ‘‘a cascade of data that exceeds the finite limits of information that can be processed and acted upon by a human being in a stressful and complex multi-tasking environment’’ (p. 60).

of information (Kapucu, 2006).[13] Thus, to discern relevant information for involved organizations and make decisions about information distribution are important tasks for boundary spanners (i.e., distribution of gathered information) (Janssen, Lee, Bharosa, & Cresswell, 2009). However, problems may arise when informational needs are not known to the boundary spanners (Janssen, Lee, Bharosa, & Cresswell, 2009).

Kapucu (2006) stresses that boundary spanners play the most significant role in cases where structured communication channels do not work efficiently (e.g., in larger extreme emergencies dominated by increased uncertainty). In these situations, communication and inter-organization can be better facilitated through individual relationships on multiple organizational levels. Thus, such network based organizational interaction and exchange facilitates adaptability in situations where hierarchically structured communication fails (Kapucu, 2006). However, a good balance between organizational flexibility and structure can be challenging to achieve (Comfort, Dunn, Johnson, Skertich, and Zagorecki, 2004).

2.3.4 Intergroup relations

Intergroup relations may affect collaboration in emergencies (Ödlund, 2010). Generally, groups are defined according to both internal and external criteria (Tajfel, 1982). The internal criteria relates to *group identification*. Group identification may be summed up as the group members' awareness of their membership, their evaluations the awareness, and the emotional investment in the awareness and evaluation (Tajfel, 1982). The external criteria are the recognition of a group's existence by "outsiders". Note that this definition applies to organizations and sometimes also teams (in the present context e.g., operational staff, SAR team, on-scene leadership team, etc.).

When both the internal and external criteria are fulfilled, and two or more groups are present in a given context, the phenomenon of *intergroup behavior* may arise (Tajfel, 1982). Sherif (1966) defines intergroup behavior: "Whenever individuals belonging to one group interact, collectively or individually, with another group or its members in terms of their *group identification*, we have an instance of intergroup behavior" (p. 12, emphasis added). Intergroup behavior can be contrasted with *interpersonal behavior*, which denotes interaction

[13] When the role, boundary spanner, has been institutionalized is has been denoted information orchestrator (Janssen, Lee, Bharosa, & Cresswell, 2009).

as individuals (i.e., not as a member of a group) (Brewer & Brown, 1998). People may act on the basis of their group membership when (1) at least two clearly identifiable social categories are present, (2) low variability in perceptions, attitudes, or behavior among individuals in each category, or (3) low variability in perceptions and judgments about other group members (Tajfel, 1979). A fundamental effect of the group categorization process is a tendency to exaggerate intergroup differences (Brewer & Brown, 1998). Moreover, a mirror effect is that similarities among out-group members are enhanced; a phenomenon known as the *out-group homogeneity effect* (Jones, Wood & Quatrone, 1981).

Ödlund (2010) suggests that identity and social categorization issues may be relevant when working in an operative emergency management context. For instance, it is argued that a *shared social identity* facilitates collaboration and, therefore, leads to increased effectiveness. In contrast, a lacking shared social identity may limit collaboration (Ödlund, 2010). The conditions behind this phenomenon include when members of an in-group form prejudice and faulty expectations of the out-group. Bram and Vestergren (2011) argue that emergency management may benefit from making salient more including social categories, such as "rescue workers" instead of separating identities such as "police", "ambulance workers" etc. They further speculate that such transformation may result from collaborative training (i.e., including all personnel from multiple EROs. Furthermore, working in environments where personnel are exposed to threat may serve to strengthen bonds between individuals (Bram & Vestergren, 2011).[14]

2.3.5 On-scene inter-organizational collaboration

In the academic emergency management literature, inter-organizational collaboration is widely viewed as a necessity and a solution to a wide range of problems associated with emergency management (Rantatalo, 2012). As organizations often constitute a large part of the environment in where the organization functions, any given organization must relate to the other organizations involved (Dynes & Quarantelli, 1977). Berlin and Carlström (2011) distinguish between three different forms of inter-organizational collaboration in emergencies: *Sequential collaboration*, *parallel collaboration*, and *synchronous collaboration*.

[14] In a team context this phenomenon is known as *team cohesion* (see e.g., Salas, Sims & Burke, 2005).

Sequential collaboration is the simplest collaboration type and equates the traditional sequential work process of the assembly line. In an on-scene context, sequential collaboration means that the different organizations' personnel contribute at different times and waits until other persons are done before acting. In parallel collaboration, tasks are executed simultaneously in the different organizations. However, each organization is still acting on their own or side by side (i.e., tasks and responsibilities are strictly distributed), and help is not provided over organizational boundaries (this also involves staff assistance). Standardized roles and established procedures characterize the operative work organization. Every organization's mission is clearly defined, and every personnel group follows the predetermined agenda accordingly. What separates parallel collaboration with the third type, synchronous collaboration, is that the different organizations' personnel exchange tasks in a prestigeless and seamless manner. The personnel groups look for opportunities to assist across predefined organizational tasks and responsibilities. The cross-organizational task exchange happens spontaneously and naturally, through rapid resource reallocation and flexible behaviors (i.e., covering for others when help is needed). A main distinction of synchronous collaboration involves the personnel's focus. That is, the focus of work shifts from the execution of own organizational tasks to finding the best way for collectively carrying out the mission. In other words, reaching the overall mission goal becomes more important than separate organizational tasks. As cross-organizational assistance may involve stepping outside of one's professional competence area, the personnel often must improvise as they go along (Weick, 2001).

In organizations today, the team, rather than the individual, is most often the basic collaborative unit of the work organization structure (Devine, Clayton, Philips, Dunford, & Melner, 1999). The team based structure is also applicable for EROs (e.g., operative field units) (Schaafstal et al., 2001; Schraagen & van de Ven, 2008, 2011). The next section will review the team and its role in emergency response.

2.3.6 Team organization

Salas, Dickinson, Converse, and Tannenbaum (1992) define a *team* as "a distinguishable set of two or more people who interact dynamically, interdependently, and adaptively toward a common and valued goal/object/mission, who have each been assigned specific roles or

functions to perform, and who have a limited life span of membership" (p. 4).[15] When the work organization is constituted of teams, success is not only dependent on individual characteristics and available resources; team processes are of equal importance (Marks, Mathieu, & Zaccaro, 2001). In order to achieve the collective goals, the members of teams must coordinate their activities and decisions, and share information and intentions (Johnsen & Eid, 2006).

A common feature across different team models is the Input – Process – Output (I-P-O) framework (Mathieu, Heffner, Goodwin, Salas, and Cannon-Bowers, 2000). *Inputs*, in the I-P-O framework, denote prior conditions (e.g., resources, individual and organizational characteristics) that are brought into and affect the team processes. *Team processes* are defined as the team members' "interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing taskwork to achieve collective goals" (Marks, Mathieu, & Zaccaro, 2001, p. 357). Lastly, *outputs*, sometimes called *team performance*, denote the "results and by-products of team activity that are valued by one or more constituencies" (Mathieu et al., p. 273).[16]

In emergencies, there are often multiple teams involved. The various teams engage in coordinated and collaborative action on several levels (NNPD, 2011). The teams vary in terms of expertise. That is, some teams are homogenously constituted in terms of profession and tasks (e.g., FRS smoke divers) while other are heterogenous (e.g., on-scene leadership team). Many teams in emergency response are characterized by their temporary existence (Schraagen & van de Ven, 2011). That is, teams are often put together ad hoc, and roles shift between different individuals due to work shifts. This requires a high degree of standardization of individual skills and roles; the skills need to be portable (i.e., the skills must not dependent on the presence of specific persons) (Flin & Maran, 2004). In addition, advanced team work skills are essential (Sundstrom, 1999). Schraagen and van de Ven (2011)

[15] Note that this definition has much in common with the definition provided of collaboration in section 1.6.1.

[16] Note that output or *team performance* is not the same as team effectiveness. While team performance only accounts for the outputs regardless of *how* a given task was accomplished, team effectiveness also includes how the team interacted (i.e., team process) in order to achieve the outcome (Salas, Sims, & Burke, 2005). Salas, Sims and Burke (2005) highlight the importance of this conceptual differentiation with the reminder that numerous external factors (i.e., external to the team) may also affect team success or failure. Thus, measures of team performance may in some cases be inadequate to understand the team.

note that temporary teams are associated with several problems including failing in passing relevant information to others and difficulties regarding coordinating with other team members. Moreover, a team composed of multiple organizations may increase such problems, especially when team members from different institutions and organizational cultures collaborate for the first time (Militello, Patterson, Bowman, & Wears, 2007), or when facing complex or novel problems (Schraagen & van de Ven, 2011).

2.3.4.1 The Big Five of teamwork effectiveness

Many models have sought to determine what variables that constitute *team effectiveness* (see e.g., Campion, Medsker, & Higgs, 1993; Fleishman & Zaccaro, 1992; Roby, 1968; Salas, Dickenson, Converse, & Tannenbaum, 1992). Salas, Sims, and Burke (2005) argue that the field of team research has become so fragmented and that it is not possible to use the findings in any practical way. Based on an extensive review of prior research they have, therefore, condensed the multiple variables suggested to affect teamwork into five core factors or components relevant across work domains – the "Big Five" of teamwork effectiveness. The "Big Five" of teamwork consists of four behavioral- (team leadership, mutual performance monitoring, back-up behavior, and adaptability) and one attitudinal component (team orientation). The five components are shown in table 2.3.

TABLE 2.2 The "Big Five" of team effectiveness (Salas, Sims & Burke, 2005, p. 560 – 561)

Team leadership -	The ability to direct and coordinate the activities of other team members, assess team performance, assign tasks, develop team knowledge, skills, and abilities, motivate team members, plan and organize, and establish a positive atmosphere.
Mutual performance monitoring -	The ability to develop common understandings of the team environment and apply appropriate task strategies to accurately monitor teammate performance.
Backup behavior -	The ability to anticipate other team members' needs through accurate knowledge about their responsibilities. This includes the ability to shift workload among members to achieve balance during high periods of workload or pressure.
Adaptability -	The ability to adjust strategies based on information gathered from the environment through the use of backup behavior and reallocation of intrateam resources. Alter a course of action or team repertoire in response to changing conditions (internal or external).
Team orientation -	The propensity to take other's behavior into account during interaction and the belief in the importance of the team goals over the individual members' goals.[17]

Note, however, that although the components are generic, their manifestation may differ across types of team tasks due to task constraints and that the team's needs vary during periods of the goal directed interaction (Salas, Sims, & Burke, 2005). For instance, some tasks and periods of interaction may require high levels of coordinative actions by the team leader while others do not.

In order to merge the value of the five components, three *coordinating conditions* (called mechanisms in the original article) are needed: *Shared mental models*, *mutual trust* and closed-loop communication (Salas, Sims & Burke, 2005). The function of the three conditions

[17] Note that team orientation can be differentiated from the concept *team cohesion*. More specific, "team cohesion is an attraction or desire to work with a particular team (…) rather than a general preference to work in team settings" (Salas, Sims, & Burke, 2005, p. 585).

is to ensure consistent updating of the "Big Five" and the distribution of relevant information throughout the team. The coordinating conditions are displayed in table 2.4.

Table 2.3 The "Big Five" coordinating conditions (Salas, Sims & Burke, 2005, p. 561).

Shared mental models -	An organizing knowledge structure of the relationships among the task the team is engaged in and how the team members will interact.
Mutual trust -	The shared belief that the team members will perform their roles and protect the interest of their team mates.
Closed-loop communication -	The exchange of information between a sender and a receiver irrespective of the medium.

Closed-loop communication was addressed in section 2.2.5.1, and no further descriptions will be provided here. However, the other two coordinating conditions, shared mental models and mutual trust, need a more detail review. Shared mental models are cognitive constructs that overlap among team members (Mathieu et al., 2000). Mathieu and colleagues (2000) accounts for two types of mental models in teamwork: Task-related mental models and team-related mental models. Briefly, task-related mental models are information about work tasks (e.g., use of equipment, technology, needed resources, etc.), whereas team-related mental models contain information about team functioning and behavior predictions, etc. According to Salas, Sims, and Burke (2005) shared mental models "facilitate the team's progression toward goal attainment by creating a framework that promotes common understanding and action" (p. 566). Consequently, one avoids that team members pull in different directions, and a sound foundation for the "Big Five" components is created (e.g., providing required assistance effectively) (Salas, Sims, & Burke, 2005). The second condition, mutual trust, involves team members' beliefs about each other's commitment to the team and its goal. Trust can influence a range of team processes and outcomes such as product quality, group participation, retention, behavioral interpretation etc. (Bandow, 2001). Mutual trust also mediates free sharing of information in the team and has been shown to be important for the acceptance of team leadership behavior (Salas, Sims, & Burke, 2005). In relation to the other "Big Five" components, mutual trust plays a role by affecting the team members' interpretation and response to other's behavior (Simons & Peterson, 2000). When mutual trust is established, team members may engage in the "Big Five" more effectively, instead of acting suspiciously or in other effectiveness degrading ways (Salas, Sims & Burke, 2005).

2.3.7 Situation awareness

Situation awareness is a concept that is closely related to mental models and is defined as "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future" (Endsley, 1995, p. 36). Based on this definition situation awareness becomes a function of all available information either the individual gathers it directly from the environment (e.g., the accident, the avalanche, etc.), through the use of technological artifacts, or through communication (verbal and non-verbal) with others. Situation awareness should be regarded as an end-product. That is, it is the product gained from the process where an individual acquires knowledge from available sources. The process of acquiring and maintaining situation awareness is known as *situation assessment* (Endsley, 1995). According to Endsley (1995), situation assessment is influenced by individual characteristics (e.g., experience, training, goals and objectives, etc.), task (e.g., complexity, workload, etc.), and systemic factors (e.g., interface design, automation, etc.).

Situation awareness is essential for maintaining control over the emergency response operation (Bram & Vestergren, 2011).[18] Through adequate situation awareness, the operations (e.g., material resources, information, personnel, etc.) can be more effectively coordinated in accordance with defined operation goals (Bigley & Roberts, 2012).

2.3.7.1 Shared situation awareness

Shared situation awareness is the collective extension of situation awareness, and can be defined as "the degree to which team members have the same SA [situation awareness] on shared SA requirements" (Endsley & Jones 1997, p. 47). Shared situation awareness requirements are situation specific, but can for instance include knowledge of existing risks in the operation environment or other team member's informational needs. In other words, shared situation awareness can be said to refer to the degree of overlap of common elements among team members (Endsley, 1995). Endsley and Jones (1997) distinguish between shared situation awareness and team situation awareness, the latter defined as "the degree to which every team member possesses the situation awareness required for his or her responsibilities" (Endsley 1995, p. 31). If a team members do not have adequate situation awareness of their

[18] Control may be defined as "the capacity to focus on the critical tasks that will bring the incident to a nondestructive, nonescalating state" (Comfort, 2007, p. 195).

responsibilities (i.e. *team situation awareness),* the effectiveness or performance of the team as a whole may suffer. Endsley (1995) use the following example to illustrate team situation awareness: "…in an aircraft cockpit, both the pilot and copilot may need to know certain pieces of information. If the copilot has this information but the pilot in charge does not, the SA of the team has suffered and performance may suffer as well unless the discrepancy is corrected" (p. 39). Thus, both team situation awareness and shared situation awareness are important for successful team performance.

Bolstad and Endsley (2000) suggest that the development of a shared situation awareness is dependent on four factors: (1) Shared situation awareness requirements, (2) shared situation awareness devices (e.g., communications, shared displays, and the shared environment), (3) shared situation awareness mechanisms (e.g., shared mental models), and (4) shared situation awareness processes (effective information sharing processes). The content of these factors have been addressed elsewhere and will, therefore, not be elaborated more on. In addition to these processes, other researchers have underlined the importance of the leader (e.g., incident commander) for the creating and maintaining an accurate shared situation awareness (Bigley & Robert, 2012). A more specific type of shared situation awareness also involves assuring that intentions are shared among response personnel (Pigeau & McCann, 2000; see section 2.4.1). However, developing and maintaining a shared situation awareness may be quite difficult to achieve (Salmon et al., 2008). Bigley and Robert (2012) write:

> "Since the task structure of the system [emergency response in a complex environment] is often in a constant state of flux, the assessments held by members cannot be finalized at any point in time. Furthermore, as a system becomes larger and more elaborate, fewer and fewer of its emergent properties are likely to be held in the mental model of any one individual (Weick & Roberts, 1993). As a result, evolving, discrepant, and disconnected representations can become more and more widely dispersed across the system in a short time period" (p. 1290).

In a study of response personnel, Lundberg and Asplund (2011) found that a series of elements could negatively influence the development of a shared situation awareness. These elements involve unclear communication paths, problems in managing critical dynamic information, "stuck information" due to communication in informal networks and problems in finding the right individual to contact, different frames of reference, poorly written meeting notes, lacking practice of informing about own activities, lack of documentation due to high

workload, and problems in communicating goals (long and short time), functions, capacity, and resources (Lundberg & Asplund, 2011).

From here, the attention now will be turned to a factor that often is crucial for effective emergency response – leadership.

2.4 Leadership

Proper leadership is an essential component in emergency management (Crichton & Flin, 2001). Operative leadership can be described as structure and process (Laberg, Eid, & Johnsen, 2006). Structure involves the formal organization, including the hierarchical composition of divisions and teams, and the crisis management levels (the hierarchical composition of divisions and teams is described in section 1.6.3, and the crisis management levels are described in section 3.3.3). Process denotes the way the leadership is executed. As the leadership structure is presented elsewhere, the main focus in this section will be on process. That is, how leadership is executed by individuals. Chambers (2000) defines leadership as "a process of social influence in which one person is able to enlist the aid and support of others in the accomplishment of a common task" (p. 27).

Several researchers have sought to determine that operative leaders need to possess a specific personality profile (for a review see e.g., Flin, 1996; Flin & Slaven, 1995). However, according to Flin (1996), these efforts have only yielded a list of obvious fundamental qualities such as liking to take the leadership role, have a stable temperament, and being a calm decision maker under pressure.[19] A more fruitful approach may be to investigate leadership execution. That is, what constitutes good operative leadership? Flin (1996) states: "In all cases the commander is required to assess the situation, evaluate the risk, judge and deploy the required resources, formulate a plan of action and communicate this to the response teams" (p. 223). While there obviously are many other factors that may be of importance (e.g., establishing trust, acting as boundary spanner, clear authority), Flin (1996) recognizes these as being relatively general. It was mentioned earlier that leaders have an important role for assuring teamwork effectiveness (Salas, Sims, Burke, 2005). Included in team leadership were qualities such as directing and coordinating activities, performance

[19] Some qualities do also predict a poor performance as operative leader. These include arrogance, untrustworthiness, excitability, shyness, being a loner, over-confidence, and having psychiatric symptomatology (Flin, 1996).

assessment, task assignment, and developing team knowledge planning and organization. In addition to these abilities and tasks, Bigley and Roberts (2012) highlight that the incident commanders must strive for acquiring and maintaining "the big picture" of the operations (i.e., situation awareness) (Bigley & Roberts, 2012, p. 1292).

In previous empirical work on collaboration in an on-scene context, inadequacies in leadership have been observed (Berlin & Carlström, 2011). Among the inadequacies were lack of joint decision making, difficulties in locating each other on-scene, and that the commanders only exchanged information sporadically. Moreover, instead of collaborating with the other organization present, the commanders were preoccupied with operative work within the own organization. Such observations indicate that multi-organizational leadership of operations can be a challenging task.

2.4.1 Command and control

In an emergency setting, leadership has traditionally been associated with the concepts *command* and *control* (Eid, Johnsen, & Laberg, 2006; Handmer, 2008). The concepts have their origin the traditional military command model (Handmer, 2008). Command denotes the formal authority a commander (i.e., operative leader) is legally delegated in order to direct, coordinate and control available response resources (Pigeau & McCann, 2000). Control can be defined as "that authority exercised by a commander over part of the activities of subordinate organizations, or other organizations not normally under his command, which encompasses the responsibility for implementing orders and directives" (Pigeau & McCann, 2000, p. 165). In other words, command and control involve a person's authority to lead and organize resources by coordination of personnel, materials, procedures, etc. aiming at completing the defined mission goal (Pigeau & McCann, 2000).

Pigeau and McCann (2000) note how the personnel and teams understanding of *intent* are crucial for goal attainment. That is, a common understanding of how the mission should be solved and which goals that should be reached. Intent may be both explicit and implicit (Pigeau & McCann, 2000). Explicit intent is publically expressed, and proper sharing of this type of intent depends on clear communication (e.g., the cooperative principle, information exchange, phraseology, and close-loop communication). In contrast, implicit intent is more subtle and based on habits, experiences, beliefs, and values. According to Pigeau and McCann (2000), these are reflections of personal, operative and cultural expectations (Eid, Johnsen &

Laberg, 2006). Eid, Johnsen, and Laberg (2006) have adapted Pigeau and McCann's military specific approach on leaders' intents to a more general operative setting. Their adaptation is displayed in table 2.5.

Table 2.4 Explicit and implicit intent (Eid, Johnsen & Laberg, 2006, from Pigeau & McCann, 2000).

Explicit intent (publically expressed)	**Orders, questions and answers**
Implicit intent (not expressed)	**Personal expectations:** Based on style and own experiences **Operative expectations:** Based on training, procedures, traditions of the unit and values. **Cultural expectations:** Based on societal values, moral and ethics.

In table 2.4, implicit intents are displayed as a hierarchy of expectations around mission completion. Implicit intent involves aspects such as personal habits, experiences, assumptions, values, as well as common operative expectations shared within an organization. Such implicit intents are usually acquired through training and work experience. In addition to the mentioned types of implicit intent, do society and culture affect implicit intent through providing a framework for what is expected and accepted in any given situation (Eid, Laberg & Johnsen, 2006). The concept of implicit intent thus seems to be quite similar to what Mathieu and colleagues' (2000) denoted shared mental models.

2.4.2 Decision making

One of the main tasks of leaders in emergency management is making decisions (Flin, 1996). In the decision making literature, a distinction is often made between rational and more intuitive ways of decision making. The former mode is associated with classical decision making research (see e.g., Kahneman & Tversky, 1979; Tversky & Kahneman, 1974, 1981), while the latter is connected to the "naturalistic" decision making approach (see e.g., Klein, 1993; Klein, Calderwood, & Clinton-Cirocco, 1986; Zsambok & Klein, 1997). The classical decision making approach relies on experimental data to study "optimal" decision making (i.e., gathering and weighing of alternatives according to rules of logic [expected utility]). In contrast, the "naturalistic" decision making approach turned its attention to how experts make decisions in real-life situations (Cannon-Bowers & Salas, 1998). Since the 1980s, approaches

related to the naturalistic decision making tradition has been the primary approach to understanding how operative personnel make decisions in the field (Schraagen & van de Ven, 2011).

One of the most known and widely applied naturalistic decision making models is the *Recognition Primed Decision Making Model* (RPD) (Klein, 1989). Cannon-Bowers and Salas (1998) summarize the RPD:

> According to this theory [RPD], people interpret a situation in which they find themselves by comparing it with similar previously experienced situations. When confronting a new situation they use their memory of the old situation to create a tentative representation for the new situation. This representation accounts for the observed situation data, creates expectations about activities that should be observed in the future, and specifies constraints about the characteristics of the situation that may not be observed. The situation representation is continually tested with new data. Data that are consistent with expectations confirm the representation for predicting future events and for inferring characteristics about the event that may not have been observed. Disconfirming data can either refine the representation or indicate that it must be replaced altogether, but there is evidence that sometimes it is ignored or explained away" (p. 24).

From the quote, it is evident that the described process is related to the process of acquiring and maintaining situation awareness (situation assessment). Endsley (1995) also recognized situation awareness' link to decision making stating that there is "considerable evidence that a person's manner of characterizing a situation will determine the decision process chosen to solve a problem" (p. 39).

Through the RPD-process experts rapidly analyze the situation and make decisions about appropriate and needed actions. For experts with extensive experience, this process occurs fast and automatically without the use of exhaustive and time demanding analytic mental processing (Klein, 1989).[20] However, problems may arise when individuals assess the situation inadequately, and apply wrong mental model for problem solving (Endsley, 1995). Similarly, new unknown situations may also lead to that wrong mental models are used (Endsley, 1995). Furthermore, Dörner (1980) found that complexity both decreased the willingness to make decisions and led people to postpone settling on a given alternative. On

[20] The RPD have later been included in the larger conceptual construct of *macrocognition* (see e.g., Klein et al., 2003). This theoretical perspective is however peripheral to the themes of interest here.

the other hand, Hollnagel and Woods (2005) states that decision making may be facilitated through the use of procedures. That is, given that procedures match the conditions, they may provide important decision support when the situation is dominated by complexity.

2.5 Stress

Stress research represents a large scientific field. In the present context, the factor of interest is how stress is related to barriers for communication and collaboration in an operative setting. In order to explore this connection, it is useful to start with how stress affects the individual. According to Lazarus and Folkman (1984) stress can be viewed as the result of an imbalance between demands and resources and individuals experience stress when demands exceed their perceived ability to cope with a situation. This is the founding principle of the *Transaction model of stress and coping* (Lazarus & Folkman, 1984). The key element in Lazarus and Folkman's model is the individual's judgment of the degree of environmental demand (e.g., risks, uncertainty, time pressure, complexity, responsibility, etc.), and whether one's personal resources (e.g., knowledge, skills, support from others, etc.) can effectively handle them. In a work context, it is necessary to separate between two distinct types of stress: Chronic or occupational stress, and acute stress (Flin, 1996). The chronic stress is associated with a discrepancy between demands in the environment (stressors) and an individual ability to meet the demands over a prolonged period of time (sometimes called micro-stressors). Acute stress is related to an individual's acute response to a situation that is perceived to be too demanding or challenging (e.g., serious injury, traumatic events, life endangering situations) (Flin, 1996).[21] Both types of stress are relevant for operative personnel, but as the main focus here is on EROs' work in the response phase on emergency management (situations that often involve time pressure, complex tasks, uncertainty, etc.) acute stress is especially relevant.

When the brain detects a change in the environment which is interpreted as threatening (a stressor), the "fight/flight" response is triggered (Cannon, 1915, 1929).[22] The "fight/flight" reaction has emotional, cognitive, physiological and behavioral implications, and its function is to prepare the individual to either fight the threat or flee from it. In an emergency,

[21] http://www.apa.org/helpcenter/understanding-chronic-stress.aspx

[22] The "fight/flight" response is sometimes called the "fight/flight/freeze" response. *Freeze* denotes the phenomenon when an animal stops all motion in response to a threat (Schmidt, Richey, Zvolensky, & Maner, 2008).

personnel may encounter a series of potential stressors including danger, personal loss or injury, traumatic stimuli, loss of control, fear of failure, uncertainty, time pressure, rapid changes, information overload, little information, insecurity, strain of responsibility, etc. (Weisæth, 1987, cited in Flin, 1996). How an individual manages these potential strains are determined by mediating factors such as personality, training, experience, fitness, emergency response procedures and social support (Flin, 1996). Note that while personality characteristics are relatively stable (see e.g., Flin, 2001, or Flin & Slaven, 1995, for a review of personality characteristics in response personnel), the other factors are in different degrees controllable (i.e., can be influenced through goal-directed efforts over time). Research indicates that moderate levels of stress can enhance performance, while high levels of stress acts as a degrading factor, both on the individual and group levels (Kerr & Tindale, 2004).

The manifestation of stress reactions is, to a large extent, determined by individual characteristic such as training, previous experiences, and personality (Flin, 1996). Two individuals may, therefore, respond very differently when exposed to identical stressors (e.g., control, confidence, calm versus uneasiness, irritability, loss of grasp of the situation, etc.). Thus, a situation that triggers moderate performance enhancing the stress level in one individual may create high performance degrading stress levels in others. High levels of stress can produce a wide range of negative effects, such as for instance tunnel vision (narrower attention span) and problems in focusing (Brun & Kobbeltveit, 2006). Further, a highly relevant effect in the present context is how stress influences over-learned behavior. When exposed to high levels of stress individuals tend to regress to behaviors that they know best (Weick, 1996). These and other phenomena related to stress may, for example, affect information sharing (e.g., what information is shared, with whom, and when), and the way leadership is exercised. Collaboration and communication may thus suffer (Kerr & Tindale, 2004).

2.6 The role of preparatory measures

The present thesis' main focus is on barriers that manifest during the response phase of emergency management. However, the planning or preparation phase also needs to be considered. This is because activities in this phase are important for response effectiveness (Bram & Vestergren, 2011). Perry and Lindell (2003) address these issues stating that the "achievement of emergency preparedness takes place through a process of planning, training and exercising accompanied by the acquisition of equipment and apparatus to support

emergency action" (p. 338). Considerations about equipment and apparatus acquisition are peripheral to the scope of the present thesis, but planning, training and exercise are more relevant and needs to be addressed in more detail.

Planning for emergency response in a variety of scenarios is an important preparation phase activity. Planning for different scenarios should build on prior risk analysis (Weisæth & Kjeserud, 2007). Moreover, the plan should be flexible enough to account for uncertainty and unexpected events, and subsequent improvisation (Chen et al., 2011). However, although the existence of plans is crucial for response effectiveness, some researchers argue that a collaborative planning process (i.e., joint organizational) is of equal importance (see e.g., Dynes & Quarantelli, 1977; Perry & Lindell, 2003; Quarantelli, 1997). A joint collaborative planning processes, forms relations and structures that make real emergency response easier (Bram & Vestergren, 2011). Following Perry and Lindell (2003), training and exercise are other preparation phase activities that also are important for response phase communication and collaboration effectiveness. Methods for training involve, for instance, basic education in individual skills, table-top exercises, virtual simulations, and full scale multi-organizational exercises. Through training and exercise a range of emergency response qualities can be improved. Examples of areas may include coordination, both within and between teams and organizations, effective communication and information management, situation adaptation, effective leadership, proper decision making, and stress management. In a multi-level and multi-organizational perspective full-scale realistic exercises may be of special significance. Perry and Lindell (2003) write:

> "Emergency drills and exercises provide a setting in which operational details may be critically examined (Ford and Schmidt, 2000; Simpson, 2001; Alexander, 2003) (…) They bring responding organisations into contact and allow individuals to develop personal relationships with one another. Furthermore, drills constitute a simultaneous and comprehensive test of emergency plans, staffing levels, personnel training, procedures, facilities, equipment and materials" (p. 346).

Flin (1996) addresses the specific training requirements for operative leaders. While recognizing that leaders accumulate much experience in managing routine events, they get less training in handling larger and more complex situations. Flin (1996) points to the use of simulators as a way of building competence for such events. Further, in an on-scene leadership context Flin (1996) states that inter-organizational communication and cooperation can be improved by joint training exercises and course lectures from other

organizations personnel. In addition, learning from past successes and failures is important; especially in the context of major events (Flin, 1996).

In order to provide a comprehensive framework for exploring the present thesis research question, this chapter has reviewed a wide variety of literature. The chapter started with an outline of systems perspective and error analysis, before the attention was turned to communication, collaboration, and related themes. The last two sections reviewed the role of stress and preparatory measures emergency response. The next chapter will address the case selected for the study: The ERS in the Sør- and Nord-Trøndelag counties, Norway.

3. THE CASE: EMERGENCY RESPONSE IN SØR- AND NORD TRØNDELAG COUNTY, NORWAY

The case investigated in the present study is operative communication and collaboration in the between selection EROs in the ERS in Sør- and Nord-Trøndelag county, Norway. The study focuses on barriers which mid-level ERO leaders perceive to be relevant in hindering or limiting communication and collaboration between EROs, organizational units and organizational levels. The investigation has exclusively been focusing on land operations such as Search and Rescue operations (SAR), traffic accidents, fires, avalanches, landslides, etc.

The present section will give an account of the involved organizations, and how these interact in emergencies and. The focus will be on the sharp end of crisis management. However, as an understanding of the larger organizational system is necessary for a full comprehension of the results, higher crisis management levels and crisis management principles will also be presented briefly. First, a short presentation of the counties in which the study has been carried out will be given.

3.1 The counties

3.1.1 Sør-Trøndelag

Sør-Trøndelag is located in the middle region of Norway. The county has a population of approximately 300 000 (09.09.2012) in twenty-five municipalities.[23] Trondheim is the largest city and the administrative center and fifty-nine percent of Sør-Trøndelag's total population resides here. Sør-Trøndelag's surface area is 18 856 km^2 and has a high degree of topographical diversity including fjords, forests, islands, agricultural landscapes, highland plains and mountains. A map of Sør-Trøndelag is displayed in figure 3.1.

Figure 3.1 Map of Sør-Trøndelag county.[25]

[23] http://www.stfk.no/no/Fylket_vart/Fakta_og_tall/

[24] http://www.norge.no/kart/Sortrondelag

3.1.2 Nord-Trøndelag

Figure 3.2 Map of Nord-Trøndelag county.[26]

Nord-Trøndelag is Sør-Trøndelag's northern bordering county. The county has 133 390 inhabitants (01.01.2012) in twenty-three municipalities.[25] In terms of surface area, Nord-Trøndelag is 22 396 km^2. The largest city is Steinkjer, which also is the county's administrative centre. Topographically Nord-Trøndelag to a large degree resembles Sør-Trøndelag. A map of Nord-Trøndelag is shown in figure 3.2.

The presentation will now turn to outlining the organizations involved in the present thesis.

3.2 The emergency response organizations

Personnel from six different EROs have participated in the present study: The police, the FRS, the HS, the NHG, the NCD, and the NRCSRC. In terms of emergency management, these organizations constitute two different groups: The organizations working daily in managing events, the EAs (i.e., the police, the FRS, and, the HS), and the organizations only used when the emergency agencies' resources (i.e., materials, personnel, or expertise) are deemed to be inadequate in order to handle a situation effectively, the SROs (i.e., the NCD, the NHG, and, the NRCSRC). When the terms EAs and SROs are used hereafter, they do only include the organizations included in the present study.

3.2.1 The emergency agencies

3.2.1.1 The police

The police has the cross-sector leadership in all operations where human health and life are threatened if no other authority is delegated the responsibility (General Service Instruction for the Police, 1990). The organization thus initiates and manages all rescue operations (i.e., traffic accidents, SAR-missions etc.), armed missions, as well as joint peace time operations with the Norwegian Armed Forces (NNPD, 2011). This means that the police lead the joint

[25] http://www.ntfk.no/NordTrondelag/Sider/default.aspx

[26] http://www.norge.no/kart/Nordtrondelag

efforts of the NSARS.[27] The police may, therefore, be regarded as the central Norwegian civil preparedness actor (NMJP, 2005).

The *operations leader* at the *police's operations centre* coordinates all operations (NNPD, 2011). When major emergencies or crisis occur, the *chief of police* may establish an operative staff in order to cope better with situation demands and relieve the work load of the operative leadership. The chief of police may also, in rescue operations, summon a strategic *multi-organizational leadership group* consisting members from prominent preparedness organizations (NMJP, 2008). The leadership group's objective is to provide decision support for the chief of police, as well as supporting a shared situation awareness among the involved organizations (NNPD, 2011). The police districts reports to the NNPD, which is organized under the NMJPS.

The police's operations on-scene is led by an *incident commander*, who also has the cross-organizational command (NNPD, 2011). In addition, a variety of other leadership roles may be established according to situational demands. The most prominent additional role is the *operations scene commander* (NNPD, 2011). The police's main on-scene tasks and responsibilities are establishing incident command, leading and coordinating the rescue efforts on behalf of the Rescue Sub-centre, securing the area and controlling access, getting an overview over people involved (injured and dead), collecting information, and passing information to the involved, relatives and the media (NMJP, 2008).

The Sør- and Nord Trøndelag counties constitute two police districts with coinciding territorial county borders. The operations centers are located in Trondheim (Sør-Trøndelag) and Steinkjer (Nord-Trøndelag).

3.2.1.2 The fire- and rescue service

The FRS's main tasks are to protect the local communities and municipalities against accidents and the harm caused by fire and acute contamination, and their tasks include both prevention and preparedness measures.[28] In Norway, it is the municipalities' responsibility to

[27] NSARS operations are coordinated operations from one of the two Joint Rescue Coordination Centers according to their respective territorial responsibilities (roughly separated into southern and northern Norway). In land operation the coordination responsibility is usually delegated to a Rescue Sub-centre at the involved police district(s) (NMJP, 2008). There is one Rescue Sub-centre in every police district in Norway.

[28] http://www.tbrt.no/Topp/om-tbrt.html

establish and operate a FRS (The law of fire- and explosion protection, 2002). The FRS may thus be characterized as a highly decentralized organization. In sparsely populated areas, some municipals do, however, have local cooperative agreements about running a FRS.[29] Although is the municipalities are responsible for establishing and operating the FRS', the NDCPEP has the vocational responsibility for the FRS. The FRS also reports to the NDCPEP through the County Chief Executive (NDCPEP, 2012). The NDCPEP is organized under the NMJPS.

The *FRS' coordination centre* differs from the police operations center in its tasks are more focused on communication (e.g., receiving warnings, conveying resource orders, etc.) than coordinating and leading field operations. In operations, the *FRS coordinator* communicates with the *FRS scene commander*, which is the on-scene FRS superior leader (NMJP, 2008). In large operations, the *fire captain* may establish an operative staff to relieve the work load for the coordination centre and FRS scene commander (NDCPEP, 2011b).

On-scene tasks and responsibilities for the FRS include extinguishing fires, and preventing new fires from starting, stopping leakages and spreading of toxic chemicals, freeing persons stuck in cars, houses, etc. (NMJP, 2008). The FRS scene commander also functions as the incident commander until the police arrive. Moreover, the FRS may have the leadership in operations where only material- or environmental values are at stake (e.g., certain wild fires). In 2011, the FRS implemented the operative emergency management system *Unified Leadership System* (NDCPEP, 2011b).[30]

In Sør- and Nord Trøndelag there are several local FRS'. The largest is Trøndelag FRS IKS with headquarters in Trondheim. There are two FRS coordination centers in Sør- and Nord-Trøndelag; one in Trondheim and one in Namsos.

3.2.1.3 The health service

The HS's main task is to provide medical assistance in emergencies. The pre-hospital services of HS can be divided into three parts according to modes of transportation: Ground ambulance, air ambulance and water ambulance (The Norwegian Directorate of Health,

[29] http://www.dsb.no/Global/Brannvern/Dokumenter/Lysark%20skogbrannteori/Skogbrannledelse.pdf

[30] The Unified Leadership System builds on the U.S. Incident Command System and is adapted to Norwegian Conditions (NDCPEP, 2011). The purpose of the implementation was a more unified organization across municipalities and different types of events (NDCPEP, 2011).

2012). These units are coordinated from the *emergency medical communication centre* (EMCC). The EMCC also receives emergency calls and is responsible for distributing information from the scene to the hospital and higher management levels (Central Norway Regional Health Authority, 2011). In every local health authority, there is one EMCC (local-EMCC), and in every regional health authority there is a regional-EMCC (Central Norway Regional Health Authority, 2011). The Regional-EMCC is responsible for coordinating regional resources in major emergencies and crisis (i.e., in events where local HS resources are deemed insufficient). The EMCC reports to the local and regional health authorities, which further reports to the Directorate of Health. The directorate of health is organized under the Norwegian Ministry of Health and Care Services (Central Norway Regional Health Authority, 2011).

On-scene the HS organizes with two leaders: *The medical scene commander* and *the ambulance scene commander* (The Norwegian Directorate of Health, 2012). The medical scene commander, an experienced medical doctor, has the superior leadership and is responsible for the organization, coordination with other leaders that are present on-scene, while the ambulance scene commander leads the ambulance personnel's work (Central Norway Regional Health Authority, 2011).

The HS's main responsibilities and tasks on-scene are to start necessary first-aid and medical treatment, to prioritize between the injured (triage), and to transport injured and dead persons away from the scene (NMJP, 2008).

Sør- and Nord Trøndelag constitute two health authorities. There are also two EMCCs, located in Trondheim and Namsos. The EMCC at St. Olavs Hospital in Trondheim functions as the Regional-EMCC.

3.2.2 The support- and reinforcement organizations

3.2.2.1 The Norwegian Civil Defense

The NCD is a governmental SRO for the EAs and other government agencies departments (NDCPEP, 2007). The NCD's main objective is to assist the EAs in major events and accidents.[31] Jurisdictionally the NCD is organized under the NDCPEP and reports correspondingly. There are twenty NCD-districts in Norway. The NCD district offices have

[31] http://www.sivilforsvaret.no/Om-Sivilforsvaret/Oppgaver

the superior operative responsibility and lead the NCD's operations and are the receivers of notifications from the EAs.[32] The districts may establish an operative staff to support the coordination of field units.

The NCD can provide different kinds of assistance such as first-aid, SAR, fire extinction, communication, cleanse casualties exposed to chemical contamination, carry injured, and, operate gathering areas for injured. The exact type of assistance provided depends on situational requirements. The operative field efforts of the NCD are primarily channelized through two different units: *Peacetime Contingency Teams* and *Mobile Decontamination Teams.*[33] The on-scene operations are normally led by a *team commander*. Similarly to the FRS, the NCD started the implementation of the Unified Leadership System in 2011 (NCD, 2011).

Sør- and Nord-Trøndelag constitute of two NCD districts. The districts correspond to the counties' territorial borders.

3.2.2.2 The Norwegian Home Guard

The NHG is one of four organizational subunits of the Norwegian Armed Forces and constitutes the primary link between the armed forces and the civil society.[34] In terms of jurisdictionally the NHG is organized under the Norwegian Joint Headquarters, which is organized under the Norwegian Ministry of Defense. The report lines coincide with this hierarchical organizational structure. The NHG is divided into eleven districts, and all operations are coordinated by an operative staff located at each NHG district office. An Area Commander leads the on-scene operations. When the EAs are in need of the NHG's assistance the organization is mobilized by the chief of police through a formal assistance request to the Norwegian Joint Headquarters.

According to the Instruction for the Armed Forces Assistance to the Police (The Assistance Instruction) (2003) the NHG can provide three categories of assistance:[35] Administrative assistance (i.e., transportation and other administrative assistance), operative assistance (i.e., assistance in accidents, natural disasters, and similar events), and enforcement assistance (i.e.,

[32] http://www.sivilforsvaret.no/Om-Sivilforsvaret/Organisering

[33] http://www.sivilforsvaret.no/Aktuelt/Sistenytt/Ny-operativ-organisering

[34] http://forsvaret.no/om-forsvaret/organisasjon/heimevernet/om-heimevernet/Sider/om-heimevernet.aspx

[35] The assistance instruction (2003) serves as a legal framework for all civil - military collaboration.

searching and arresting dangerous persons, guarding objects). In terms of enforcement assistance, guarding is the most relevant for the NHG (ONR, 2012).

Sør- and Nord Trøndelag make up one NHG District (HV-12). The headquarters is located at Værnes Garrison in Stjørdal.[36]

3.2.2.3 The Norwegian Red Cross search and rescue corps

The NRCSRC is the largest voluntary rescue organization in Norway (NNPD, 2011). The NRCSRC is organized in nineteen districts corresponding to the Norwegian counties, and in every district there are several local NRCSRC units. In larger operations, the Red-Cross district is responsible for coordinating the NRCSRC units rescue efforts. The NRCSRC is a prominent member of the umbrella organization for Norwegian volunteer organizations, FORF.[37]

The NRCSRC can be mobilized by all three EA coordination centers depending on situational demands and local agreements. The NRCSRC operations on-scene is led by a designated *operation leader*. In terms of operative assistance, the NRCSRC personnel has specialized competence in search- and rescue, as well as evacuation activities at sea, rivers, mountains and woods.[38]

In both Sør- and Nord-Trøndelag there are several local NRCSRC units, the largest being Trondheim NRCSRC.

3.3 Norwegian crisis management [39]

The NNPD (2007) defines crisis management as the sum of the activities and measures carried out in order to protect life, health, society's critical functions, material values, limit the extent of harm, and to bring the crisis to an end. This definition is very broad in its scope and encompasses a wide variety of measures for managing adverse events including events defined here as emergencies.

[36] http://forsvaret.no/om-forsvaret/organisasjon/heimevernet/om-heimevernet/Sider/heimevernets-regioner.aspx

[37] http://forf.no/

[38] http://www.rodekors.no/vart-arbeid/hjelpekorps/omhjelpekorps

[39] In the official Norwegian discourse, *crisis management*, rather than *emergency management*, is the preferred term. Crisis management will, therefore, be used when describing principles for action and the levels of management.

Crisis- and emergency management in Norway is established according to event-specific demands (NMJP, 2008), and dependent on scale and type, the events are handled on different levels, and by different actors (NMJP, 2002; NMJPS, 2012a). The overall crisis management system may thus be viewed as a flexible system that may be adapted both horizontally and vertically according to situational demands.

3.3.1 Principles for crisis management

In both the public and the private sector, Norwegian emergency- and crisis management have until recently been founded on four principles: The principle of liability, the principle of conformity, and the principle of decentralization (NMJPS, 2012a). *The principle of liability* states that the organization or enterprise responsible for a sector, function or service in normal situations, also has the responsibility in a non-ordinary or crisis situation. The principle includes harm preventive- and preparedness measures, as well as the management of unwanted events**.** *The principle of conformity* says that there should be no prominent rearrangements in terms of organizational structure in a crisis situation; the organization should be as identical to a normal situation as possible. The third, *the principle of decentralization* states that a crisis should be managed on the lowest possible level.[40] In Report No. 29 to the Storting (NMJPS, 2012a), a fourth principle was introduced, *the cooperative principle.* The principle states that authorities, enterprises, and agencies are responsible for assuring best collaboration practices with relevant actors and enterprises in prevention, preparedness, and crisis management.

3.3.2 Line management versus crisis management

Normal or everyday incidents are handled by the line management in the EAs (NNPD, 2011). EA units respond to events either solely or in collaboration (i.e., depending on event specific characteristics). Whenever an event is of such a scale and severity that the daily line management is deemed to be insufficient to handle the situation adequately, a crisis management organization is established.

[40] There are, however, two exceptions to the principle of decentralization: Nuclear disaster/catastrophes and political security crisis should always be managed on a national political level (NNPD, 2011).

3.3.3 Levels of crisis management

Norwegian crisis management may be divided into three main management levels: Strategic, operational, and tactical (NNPD, 2011).[41] [42] These three main levels can be identified at every institutional level (local, regional, national etc.). Note that the level that is called the strategic level in a local perspective equals, or denotes, the tactical level from a national viewpoint (see figure 3.3). In accordance with the responsibility principle, the cross institutional dimensions (i.e., justice, health, education etc.) the levels are separated according to designated responsibilities and tasks (NNPD, 2011).

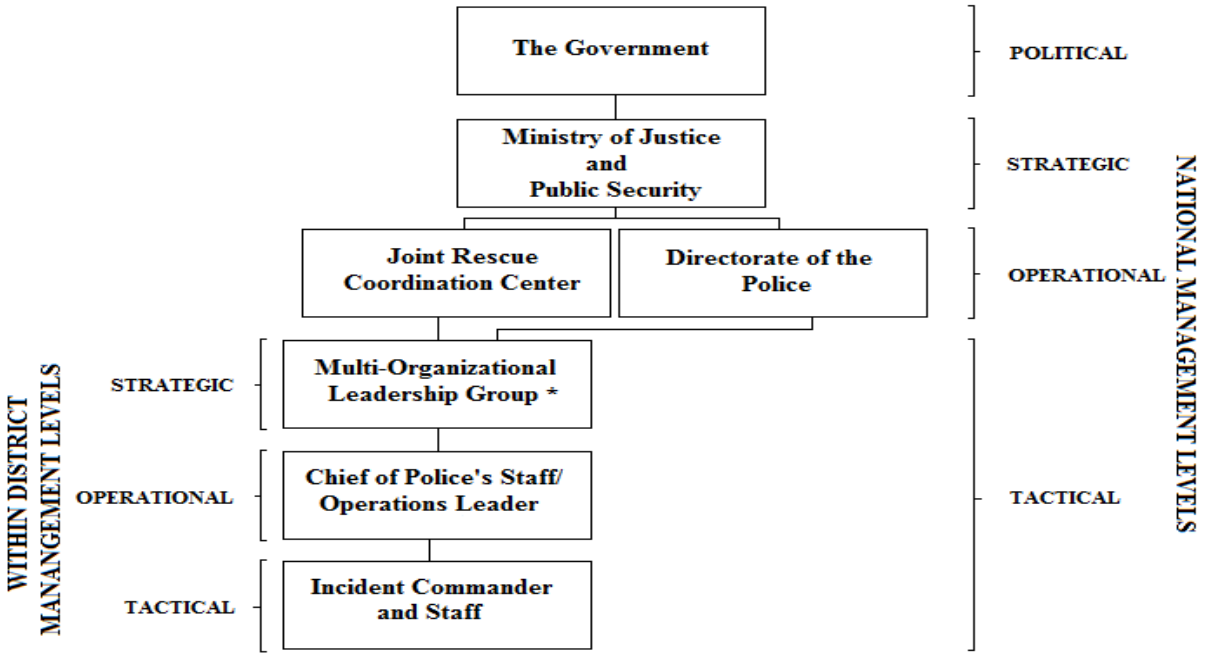

Figure 3.3 Exemplification of crisis management level integration in a national crisis where the Ministry of Justice and Public Security is the crisis owner (NNPD, 2011).

* Both the strategic and operational district levels are counted as parts of the Rescue Sub-centre (NNPD, 2011).

[41] The exact naming of these levels varies between different agencies and in academic literature. For instance, the Norwegian Health Service use the term "operative" to refer to the lowest level, and "tactical" on the middle level (CNRHA, 2011). Moreover, some scholars term the lowest level "operational" (See Njå & Rake, 2008). The terminology applied in the present thesis is in accordance with the Norwegian Police's, use of terms (NNPD, 2011).

[42] In addition to the three main levels, a fourth, higher level, may become activated in crisis of national proportions: the political level. In Norway, the political level is equivalent with the Norwegian Government (NNPD, 2011).

The strategic level involves determining superior goals (i.e., the strategy). Strategic tasks may include issues such as determining focus, superior guidance for resource use, method of choice etc. The strategic level in land rescue operations is equivalent with the multi-organizational leadership group located at the Rescue Sub-centre (NNDP, 2007). However, there may be multiple strategic levels of leadership established in different institutions. For instance the health service, involved company, and municipal or county, may have own strategic management groups with own areas of responsibility. As illustrated in figure 3.3, a ministry serves as superior strategic crisis level in a national crisis. The operational level has somewhat different tasks and responsibilities according to the specific institution in question. However, generally, the operational level is often involved in planning and coordination of the goals set at the strategic level, assuring consistency between own level and the strategic level above, registering, filtering, passing information, and ordering resources (Central Norway Regional Health Authority, 2011). Examples of operational levels on a local scale crisis or emergency may be the chief of police's operational staff, the local health enterprise crisis staff, the municipalities' crisis leadership's staff. When a crisis strikes, involved directorates are located on the operational level. The tactical level denotes the lowest level in the crisis management organization (NNPD, 2011). In the context of the present thesis, this level is associated with the operations on-scene.

From the review above it is clear that the organizational integration in emergency- and crisis management occurs on several levels. A full outline of all levels of integration is out the scope the present thesis. Here, integration on the district level is the most relevant. The strategic level in this context means the multi-organizational leadership group at the Rescue Sub-centre. The operational level translates into the communication and collaboration in the coordination centers and the SROs (i.e., SRO districts headquarters), and the tactical level is equivalent to the on-scene organization.

3.4 Operative organization

As mentioned earlier, the operative organization denotes the sharp end organization. That is, on-scene and coordination centers. The following will outline the operative organization as described in official documents (NNPD, 2009, 2011; NDCPEP, 2011b; NMJP, 2008). The focus will be on formal intra- and inter-organizational communication and collaboration structure and process. As the total operative organization may vary extensively depending on events specific characteristics, a full review is impossible due to this thesis' quantitative

limitations. The following presentation will, therefore, only provide a general outline of the most central aspects.

3.4.1 The coordination centers

The EA coordination centers (i.e., police operations centre, FRS coordination centre, and EMCC) are the point of communication for the scene commanders and are also in varying degrees active in coordination activities. In operations where the police are involved the police's operations leader has the superior operational leadership role (NNPD, 2011). Generally, the coordination centers communicate with the field personnel and coordinate the field operations. However, the FRS coordination center's role is more dominated by communication than coordination. This is because most of the FRS' operative activities are coordinated by commanders present on scene (NDCPEP, 2011b). Note that the coordination centers embody the operational level in incidents that are manageable by the line management in the EAs.

3.4.1.1 Notification

Notification here denotes the process where the EROs are notified of an adverse event. The message usually comes from an external source (e.g., person or automatic safety system) but may also come internally (e.g., especially from police units). As the EAs have distinct coordination centers with own emergency phone numbers, the first agency to receive the notification notifies the two others.[43] This is a standard procedure called triple-warning (NNPD, 2009). When notified, the EAs daily respond to emergencies. However, when the event is of such a type or magnitude that the EA line management cannot adequately handle the situation, reinforcement resources (i.e., expanding- and extending organizations in Rotanz's, 2007, terminology) are notified according to events specific characteristics. Figure 3.4 shows an example of notification and communication lines in major incidents and crisis. As the overall notification procedures are complex, involving multiple possible organizations and authorities, the figure only shows an example of notification procedures for the organizations and units represented in the present study.

[43] 110 – the FRS, 112 – the Police, 113 – the HS.

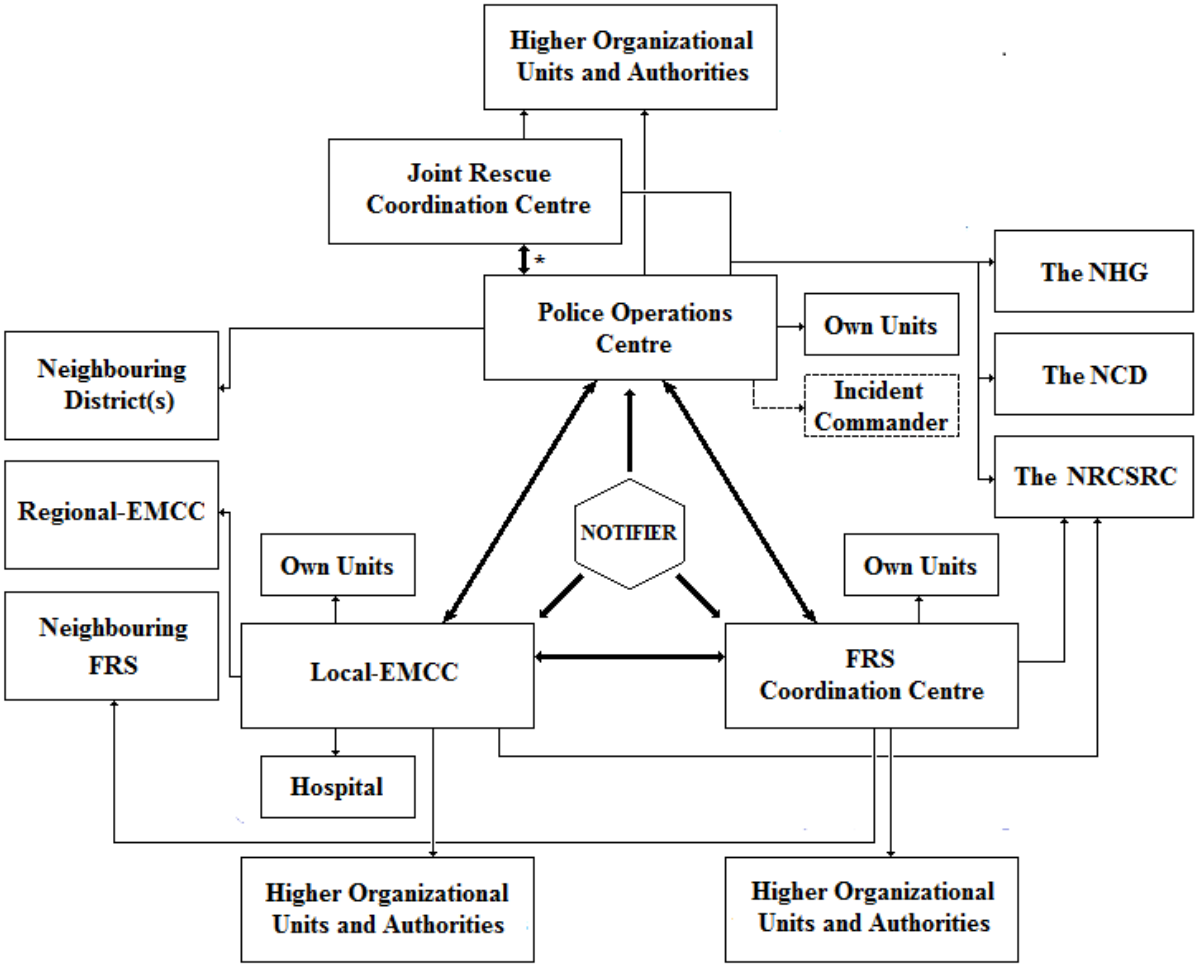

Figure 3.4 Structure of notification lines between EROs involved in the present study (adapted from NNPD, 2011; Central Norway Regional Health Authority, 2011; NMJP, 2008).

* The police operations centre discuss with the Joint rescue coordination centre if an event should be regarded as a rescue operation (NNPD, 2007).

3.4.1.2 On-scene organization

On-scene, two general categories of personnel may be identified: Leadership personnel and rescue personnel. The involved organizations' leaders should be gathered in a command-post (NMJP, 2008). From the command post, organizations leaders lead their personnel and reports back to their organizations' coordination centers. An incident commander from the police holds the superior on-scene leadership. There are two types of command posts: A SAR command post, and, a generic command post for other events (NMJP, 2008). However, the exact location and form of the command post varies situationally (i.e., resources for establishment, weather conditions, noise etc.). The on-scene SAR organization and on-scene generic organization are displayed in figure 3.5 and figure 3.6.

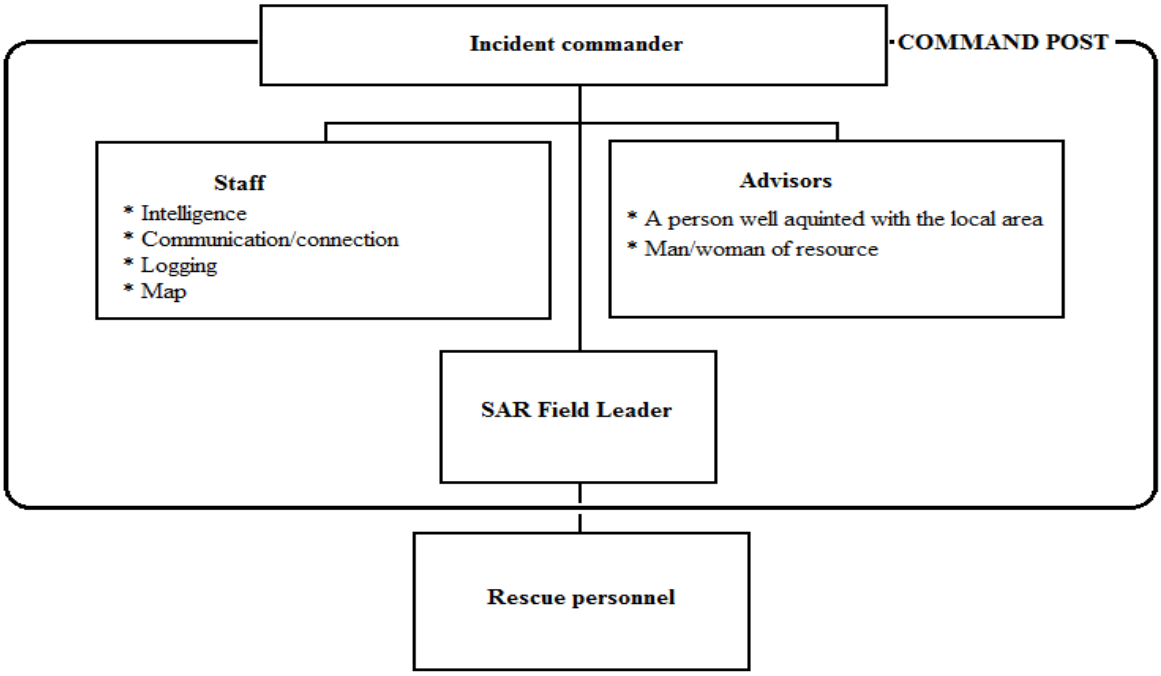

Figure 3.5 SAR command post organization (adapted from NMJP, 2008).

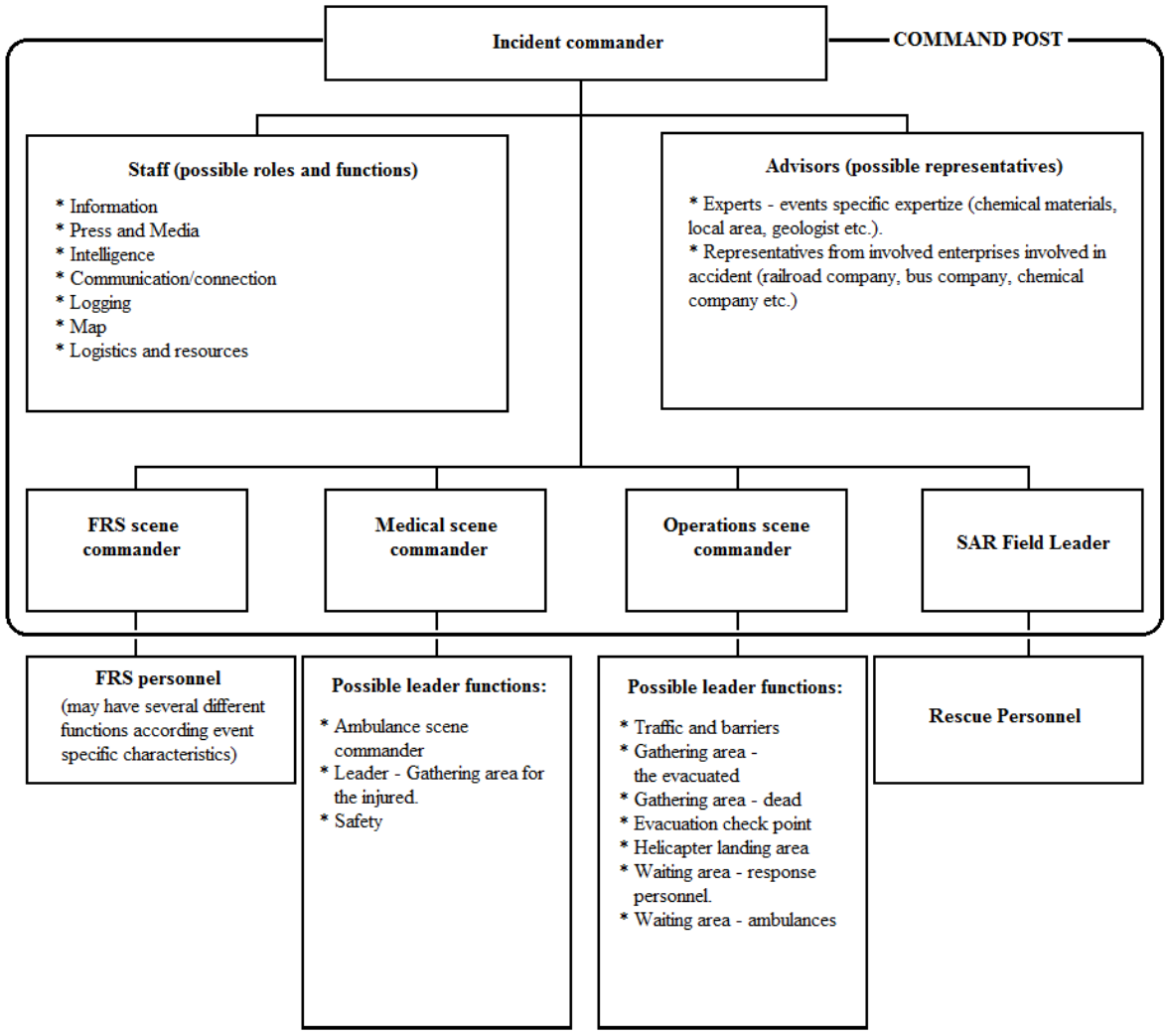

Figure 3.6 Example of generic on-scene organization (adapted from NMJP, 2008).

4. METHOD

In order to enable a broad exploration and understanding of the themes under scrutiny, it was decided to apply qualitative methods. Qualitative methods and methodologies represent a wide range of approaches and perspectives, where explorative studies may be regarded as the dominant approach (Thagaard, 2003).

In the present study, twelve in-depth interviews with mid-level leaders from six EROs have been carried out. Grounded theory methodology was used as a guiding framework for analyzing the data. In the following the study's design, data collection process, and data analysis process will be presented. Each section ends with ethical considerations pertaining to the section's content. An outline of reliability and validity issues will end the method presentation.

4.1 Design

4.1.1 An exploratory case-study design

Design in research may be described as a logical structure that establishes a connection between the initial research question, the data that are collected, and what conclusions that may be drawn (Marshall & Rossman, 2006). The present thesis falls into the category of an exploratory case study. A case-study is characterized by focusing on specific aspects of one individual, group, organization or event (Yin, 1994). The aim in explorative studies is exploring fields where there exists limited prior knowledge. The researcher often has broad or quite loosely defined initial research questions (Thagaard, 2003). Riege (2003) states that "qualitative methods such as case studies commonly follow realistic modes of inquiry, for the main objectives are to discover new relationships of realities and build up an understanding of the meanings of experiences rather than verify predetermined hypothesis" (p. 77). In the present case, the focus is on key EROs in the ERS in the Sør- and Nord-Trøndelag counties, Norway, and the central themes to be explored are those of barriers that may limit or hinder communication and collaboration within and between EROs.

4.1.2 Selection and recruitment

The informants were recruited through a combination of strategic selection and snowball sampling. Strategic selection means recruiting informants possessing specific qualifications and characteristics relevant for gathering information illuminating the research question

(Thagaard, 2003). In order to get access to relevant informants, a prominent local preparedness leader, with whom the researcher had former acquaintance, was contacted. After an initial presentation of the project, the contact person agreed to contact key personnel in EROs, and request for their participation. Some of the informants were recruited this way while the remaining informants were recruited through snowball sampling (i.e., informants suggested persons they thought could provide useful information).

Having limited resources in terms of time and capacity it was essential to have a clear conception about whom to select as informants. This selection appraisal was two-folded: First, which EROs would be the most relevant? Second, which individuals in the selected organizations could provide relevant information and valid descriptions of the themes selected?

In order to investigate the research questions in a comprehensive way, it was believed to be essential to recruit leadership personnel both from EROs engaged in emergency work on a daily basis (i.e., the EAs) and SROs only mobilized when the daily resources and capacities are insufficient (i.e., here the NHG, the NCD, and the NRCSRC. By doing so, the hope was to shed light on a wider range issues than would have been possible if the study had only included the professional emergency workers. The final choice was to include six different EROs: The police, the FRS, the HS, the NCD, the NHG, and the NRCSRC (see section 3.2 for a presentation of these organizations). Together these constitute some of the largest and most active EROs in land operations (NNPD, 2011).[44] Moreover, in order to obtain information of the chosen themes, it was decided to focus on mid-level leaders. This decision was based on several assumptions. An assumption was that mid-level leaders have more insight into the underlying organizational processes and structures, and, therefore, could provide more contextual information than purely specialized personnel. A second assumption was that these leaders both have operative experiences themselves and get continuous reports from the personnel on the lower organizational levels. This enables them to accumulate a broad knowledge base of the themes of investigation. Moreover, the chosen organizations also have an experience based recruiting system founded on rank structures. That is, in order to hold an operative leadership position the personnel work their way bottom-up through the

[44] Note that the listed organizations are not the only EROs with a potential operative role in emergencies. For a more comprehensive list of EROs see NNPD (2011).

rank hierarchy. The result is that mid-level leaders usually have years of operative practice and experience. All, but one of the informants had over ten years of operative experience. The majority had over twenty years of experience. Two informants from each organization participated in the study. The design of the selection of informants is displayed in figure 4.1.

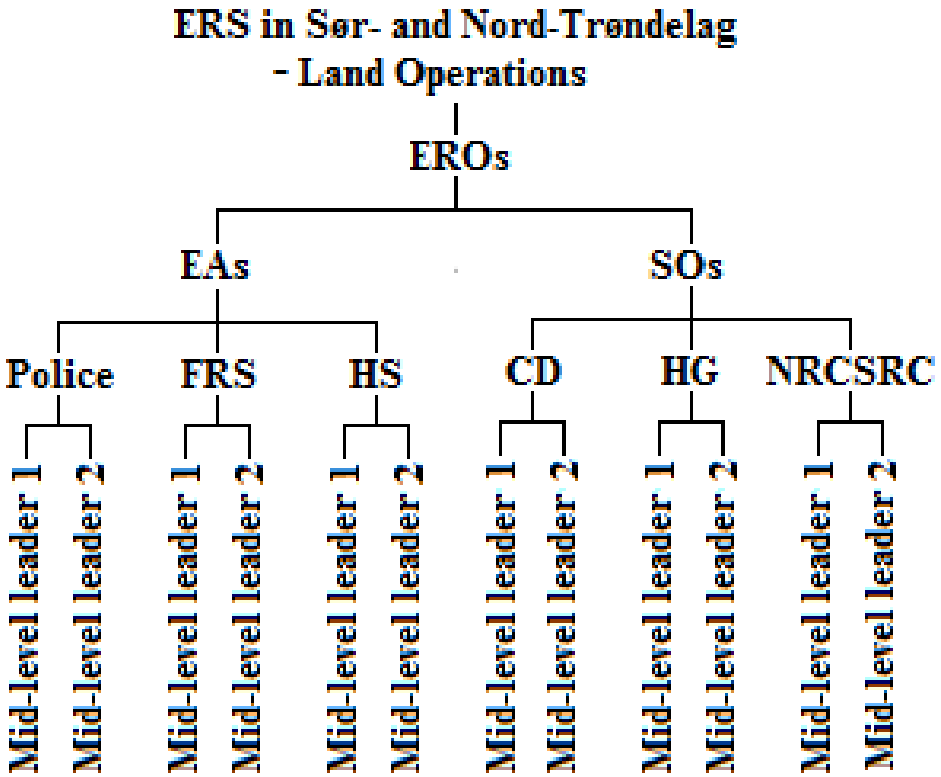

Figure 4.1 Design of the selection of informants.

4.1.3 Ethical considerations about the design

In interview studies, ethics encompass issues such as obtaining informed consent, securing anonymity and confidentiality for the informants, to stay loyal and sincere to the data, and not engaging in fraud. Ethical conduct is not limited to a specific phase, but a continuous activity throughout the research process (Kvale, 2001). In Norway, all projects involving storage and processing of personal information or/and sensitive information are obliged to be reported and approved by a national organ. For the social sciences, this organ is the privacy protection unit at the Norwegian Social Science Data Service (NSSDS). A few weeks after having reported the study, the unit gave a positive response, and the data gathering could begin.

In interview studies where data are gathered and stored, confidentiality issues are important to consider (Langdridge, 2004). Confidentiality means that information that may contribute to revealing any informant's identity is not publicized or in other ways made available (Kvale, 2001). Confidentiality may be pursued in different ways depending on how information is gathered, stored, and presented in the end product. Two potential problems concerning confidentiality have been identified. Firstly, as informants work in the same organization, and it is possible that they know about each other's participation. Secondly, as snowball sampling has been applied for recruiting participants, some of the informants may also remember which person(s) they suggested, although they do not necessarily know if they actually participated.

4.2 Data Collection

4.2.1 A Semi-structured research interview

In case studies, interviews are one of the most important data sources (Yin, 1994). The aim of the qualitative research interview is to get the informant to describe specific aspects of his or her life world (Kvale & Brinkmann, 2009). The researcher has to coordinate the interview by asking the questions that are regarded as being the most appropriate in order to get the relevant information (Willig, 2008). A semi-structured interview format was chosen as the preferred type of qualitative interview. This kind of research interview is neither rigidly fixed nor totally open but rather guided by predefined themes the researcher wishes to cover (Kvale, 2001). In order to pursue the chosen themes, some central questions were developed. The questions were arranged in an *interview guide* (see Appendix A). The interview guide can be described as type of manuscript that provides structure, and, thus, functioning as a valuable aid while interviewing (Kvale & Brinkmann, 2009).

It was thought to be an advantage to have a relatively small number of open ended and wide questions. This choice was based on two considerations. Firstly, the research area was initially quite broadly defined and by constructing a few open ended and wide questions the relevant themes could be explored by allowing the informants to focus on the matters they found most important. Furthermore, it allowed the researcher to follow-up on relevant aspects not considered prior to the interview (Charmaz, 2006). Secondly, experts have extensive knowledge of their fields and will, therefore, often "respond well to inquiries about broad areas of content and to open-ended questions that allow them the freedom to use their knowledge and imagination" (Marshall & Rossman, 2006, p. 106). Although this strategy (i.e., using a low degree of structure for semi-structured interview) may be challenging, a

more structured approach with many predefined questions was regarded as a potential limitation both in of terms the explorative approach and the variety of possible types of responses. The benefits of rich explanations were thought to exceed the costs of loss of comparability across respondents. However, to avoid that the interviews became too unstructured and broad in terms of content, probing for more specific information within each theme was the used strategy; a technique called *funneling* (Langdridge, 2004). An aiding list of probes was developed and memorized prior to the interviews (see Appendix B).[45] Funneling enabled both an exploring of predefined themes and new aspects brought up during the interviews.

4.2.1.1 The interview guide

The interview guide consisted of three main sections. The first section was devoted to background information (organization, position, number of years in position, and prior work experience). The second part focused on the informants' experiences related to challenges in operative communication and collaboration. The section aimed to investigate the ERO leaders' own experiences of prior operations, and the challenges faced in operative practice. The final section sought information about potential operative communication and collaboration challenges. That is, challenges that the informants at the time of the interviews had not experienced but which were perceived as possible future challenges. This section was included in order to proactively seek to discover challenging aspects that were perceived as latent in the existing or planned ERS. Generally, the questions were most often asked in the order of the interview guide, but when themes were brought up by informants prior to their order in the interview guide, the commenced course was adapted. This flexibility, made possible by the semi-structured interview method, proved to be practical throughout all the interviews.

4.2.2 The interviews

The following will present the issues related to the execution of the pilot interview and the main interviews.

[45] Note that the probes used were not limited to those listed; other suitable probes where applied spontaneously as they came to mind during the interviews.

4.2.2.1 The pilot interview

In order to test the interview guide, a pilot interview was carried out. One informant with considerable knowledge about the field and themes in question was recruited for pilot interviewing. The interview was carried out in May 2011. After the interview, the interview guide was evaluated, and some alternations were made. The main alteration was adjusting to a narrower scope. Two of the initial research themes, coordination and decision making, were excluded from the interview guide as explicit foci. These alterations were done both due to time constraints and in order to clarify the study better. After the adjustment two themes remained: Communication and collaboration. The result of the specifications was that some questions were eliminated while others were reformulated (see Appendix C). In addition to enabling a clarification of the study, the pilot interview also provided additional interviewing experience.

4.2.2.2 The main interviews

The twelve interviews were carried out in May and June, 2011. Prior to the interviews, appointments were made to meet the informant physically in a location of their preference. In all cases, the interviews were carried out in an office or a meeting room at the informants' work place. Before the interview started, the interviewees were given a two-page information sheet about the study to read. The sheet also contained an informed consent agreement. After the agreement was signed, the interview could start. A non-digital recording device was utilized during all the interviews. The interviews lasted from 38 to 68 minutes, with an overall mean of 49 minutes. The thirty minute difference between the shortest and the longest interview was due to level of detail, number of covered issues, and personal expressive styles (e.g., speed of speaking and number of words used to express an idea). Thus, it was not necessarily the longest interviews which provided the most relevant information.

4.2.2.3 A note on interviewing experts

Interviewing experts (i.e., here mid-level leaders in EROs) may introduce specific challenges for a researcher (Marshall & Rossman, 2006). The interviewer must master the technical language used in the relevant expert areas, and should have considerable knowledge about the profession(s) or field(s) in question. In order to prepare for these challenges, an extensive reading on the various organizations was undertaken (e.g., official documents, educational material, preparedness plans, handbooks, websites, etc.).

4.2.3 Ethical considerations about the data collection

Because of its personal and interpersonal nature, in-depth interviewing can be regarded as one of the most intrusive research methods (Thagaard, 2003). Ethical considerations are, therefore, highly important. In order carry out qualitative interviews ethically, informed consent from the participants is a mandatory procedure (Langdridge, 2004). Informed consent means informing about the general aims and purpose of the project, voluntariness, the right to withdraw without consequences, the use of recording device, confidentiality, etc. The informant should be provided with sufficient information to enable an informed choice about whether or not to participate (Silverman, 2006). In the present study, informed consent was obtained through a two page written text, given to the informants for them to read and sign before the interviews (see Appendix D). Furthermore, prior to the interviews the participants were presented with information about the aim and general content of the study, opportunity to withdraw from the study during, or after, the interview. If they decided to do so, the informed consent agreement would be expunged and the recording deleted. None of the informants neither refused to sign nor later decided to withdraw.

4.3 The data analysis

4.3.1 Transcription

Transcription of the interviews was carried out by applying a simple transcription system (Langdridge, 2004). The simple transcription system was chosen both due to the amount of data gathered and the explicit character of the investigation. That is, the aim was to study communication and collaboration barriers, and, therefore, the focus in the transcriptions was on specified themes and the interviewees' factual claims about these phenomena.

All the interviews were transcribed as shortly after the interviews as was practically possible (i.e., in May and June, 2011). The interviews were transcribed by the researcher using the computer software Microsoft Office Word 2007. Throughout the transcription process, the researcher had a special focus on anonymizing statements that potentially were traceable to a specific informant. The transcription process gave an in-depth repetition of the material, thus, enabling a better acquaintance with the text, and helping to extract and systematize the analytic ideas from the interviews.

4.3.2 Translation

All the interviews were undertaken in Norwegian. In order to enable a presentation of example statements from the informants in the final text, the selected quotes had to be translated into English. Translation of such material is a very complex process involving subtle matters of connotation and meaning (Marshall & Rossman, 2006). Because of these complexities, it has not been an aim here to translate the transcriptions word by word, but rather to present summarized statements of the informants' utterances. In other words, the focus has been to present the main message in the selected quotes as accurately as possible. In order to enable cross-checking of the translations, the original Norwegian transcribed quotes are included in the endnotes. Note that the summarized statements are presented in italics in the result section.

4.3.4 Coding the material

4.3.4.1 A Grounded theory inspired analysis

Grounded theory has been the preferred methodology for analyzing and coding the data. The methodology was developed by Barney Glaser and Anselm Strauss in 1967 as a means for conducting systemized qualitative analysis (Glaser & Strauss, 1967). Charmaz (2006) describes Grounded theory in the following way:

> "Grounded theory is a method for conducting qualitative research that focuses on conceptual frameworks or theories through building inductive analysis from the data. Hence, the analytic categories are directly 'grounded' in the data. The method favors analysis over description, fresh categories over preconceived ideas and extant theories, and systematically focused sequential data collection over large samples" (p. 187-188).

The following section describes the analysis process.

4.3.4.3 Coding regime

Strauss and Corbin's (1990, 1998) guidelines for coding were used as an inspiring framework. By inspiring it is meant that the framework was not followed rigidly, but rather provided some useful tools for analyzing text thematically. Strauss and Corbin (1990, 1998) provide three qualitative interlinked steps for coding qualitative material: *Open coding*, *axial coding* and *selective coding*. Note that these steps are not sequential, but are rather to a large extent carried out in parallel.

The analysis started with reading through the material several times. Doing so provided better acquaintance with the material and continued the process of immersing in the data. While reading through the material I also started writing memos (i.e., spontaneous thoughts and analytic ideas). The memo-writing was a helpful analytic tool throughout the coding process.

The read-through led to the analysis process of open coding. Open coding denotes the process by which the data is sought to be opened for all possibilities and potentials existing in the material (Strauss & Corbin, 1990, 1998). Through open coding, the data is broken down into small bits and pieces which then are given distinct descriptive labels - *concepts.* This process may be done in different levels of detail (Strauss & Corbin, 1990). Due to the explicit focus of the investigation it was chosen to code sentences and paragraphs rather than a more detailed line-by-line coding. In practical terms, open coding means asking questions to the material such as "what happens here?", "What are this sentence really about?", etc. As the analysis proceeded, the data bits were constantly compared so that a similar phenomenon could be given the same label; a process called constant comparison (Strauss & Corbin, 1990, 1998; Charmaz, 2006). Through this process, patterns in the data slowly started to emerge. However, the data were still neutral in relation to the initial research question, which had an explicit focus on challenging aspects. Therefore, all data that clearly concerned irrelevant matters were eliminated from further analysis. In addition, the number of concepts was still high, making the material rather difficult to manage. In order to make the material more comprehensive, the concepts were ordered into *categories* by clustering concepts seeming to pertain to the same phenomenon (Strauss & Corbin, 1990, 1998). Thus, through categorization the conceptual level is raised from being rather descriptive to a higher level of abstraction (Charmaz, 2006).

Simultaneously with the open coding process, I was also involved in axial coding. Axial coding refers to the process where the categories are systematically developed and connected to their subcategories (Strauss & Corbin, 1990, 1998). The focus is on specifying categories in order to explain phenomena in a more precise and encompassing way. While the data in open coding are split up and fragmented, axial coding puts them together in new ways. Through axial coding, one pursues the answers to questions such as where, when, why, who, how, and with which results and consequences, related to a phenomenon (Strauss & Corbin, 1990). In other words, categories or phenomena are specified in relation to a context, intervening conditions, actions/interactions, and consequences (Strauss & Corbin, 1998).

Thus, the final results contained both aspects linked to process (i.e., dynamic) and as well as structure (Strauss & Corbin, 1998).

As the analysis proceeded, it became clear that some of the data bits could be pertaining to more than one concept or category. This problem was handled in a pragmatic way by placing the data in the concept or category which was the most dominant (i.e., the main objective the informant seemed to be conveying). For instance, a quote from an NRCSRC informant about how only some organizations were to be included in the new national ICT system, TETRA, was placed in the category "ICT barriers" rather than "organizational barriers". That is, in a practical and direct sense, not being included in the TETRA-net was more related to ICT issues than organizational issues.

The last of the coding sequences, selective coding, involves shrinking the scope of analysis and finalizing the analytic results (Corbin & Strauss, 1990, 1998). Since the present study use the Grounded theory methodology as a tool for building a conceptual framework rather than an integrated theory, selective coding involved two processes: Arranging the generated categories around a core-category (i.e., a category which all categories may be organized around), and on the basis of this, eliminating irrelevant aspects.[46] The core category resulting from the present analysis was denoted *barriers*.

4.3.4.3 Use of computer software

The computer programs NVivo 9 and Microsoft Office Word 2007 have been used in the analysis process. NVivo 9 is an analytic tool developed to support coding of qualitative data.[47] The software is especially helpful in qualitative analysis that involves thematic categorization (e.g., Grounded theory). NVivo 9's structure and organization made the whole process of analyzing more systematic and easily manageable. Moreover, the software was a valuable tool in the process of comparing parts of the material, and its perspicuous lay-out was very helpful to keep an overview of the concepts and categories. Microsoft Office Word 2007 was mainly used to assist the integration of concepts and making overview tables of the material. It is important to note that neither NVivo 9 nor Microsoft Office Word 2007 is doing the analysis for you. That is, although the analysis process is aided by the software, the researcher must

[46] Fully integrated theory generation would also implicate a more strict pursuit for theoretical saturation (see e.g., Corbin & Strauss, 1990; 1998).

[47] http://www.qsrinternational.com/products_nvivo.aspx

ask questions to the material, decide what to code, and systematize the concept and categories.

4.4.5 Ethical considerations about the data analysis

In order to assure confidentiality in the data analysis stage, several measures were taken. Firstly, throughout the transcription process considerable efforts were made in ensuring the written texts were continuously anonymized. Anonymizing information means excluding or editing words, sentences or/and paragraphs that might enable identification of individuals (Thagaard, 2003). As qualitative interviews may be characterized by rich and detailed descriptions, anonymizing may be a challenging task. Further, in order to avoid recognition of informants in the text presented in the result section, the informants are not numbered or specified in any way. However, due to the study's objective it has been necessary to link certain summarized statements to specific organizations. Secondly, information about every informant was stored in four separate ways: One handwritten list containing the contact information of every participant, background information documents, main interview documents, and a non-digital recording device containing the recordings. The anonymized transcriptions and background information documents were then stored separately on a memory stick without any type of document codes enabling linking them together. The memory stick was kept in a locker when not in use. The recordings were particularly important to protect as they contained information enabling identification of informants. All recordings were, therefore, erased after the transcriptions were finished. Based on the confidentiality measures taken, it is the researcher's conviction that the quotes and information presented in the final product will not be traceable to any individual informant. Moreover, all data were deleted when the thesis was completed.

Because of confidentiality issues the gender distribution of informants is not revealed in the end-product. This also accounts for how many informants there were from each of the included counties. The reason for keeping this information confidential is that the ERO milieu is relatively small in the two counties and specifying more details could possibly implicate that informants may be identified.

4.5 Reliability and validity

Reliability and validity denote the evaluation criteria for scientific studies. Reliability involves to which extent the study has been carried out in a reliable manner so that the results are true relative to the phenomena of study, while validity concerns issues of whether one has

measured what one aimed to measure (Langdridge, 2004). A matter that is important underline in relation to these two concepts is that high reliability is not a sufficient condition for assuring the validity of the data. That is, precise gathering and treatment of the data does not guaranty that they can be used to shed light on the given research question. High construct validity is needed in addition.

It is debated in the literature if validity and reliability are appropriate criteria for qualitative studies (Miles & Huberman, 1994). This is because the concepts initially were developed for quantitative measurement and theory testing purposes. The objections are primarily two-folded: Firstly, it involves if validity is relevant in qualitative case studies, and, secondly, which validity criteria that are appropriate. Consequently, there is no available commonly agreed upon set of reliability and validity tests for qualitative date in the literature (Maxwell, 1992; Riege, 2003). However, there is no doubt that is important to evaluate whether the researcher has followed rigorous methodological procedures. Having done so, it is also important to consider if the results are true to the information received from the interviewees, and if the result are of such quality that they could be applied to an extended context.

4.5.1 Reliability

A study's reliability is determined by how the procedures that have led to the results have been carried out (Miles & Huberman, 1994). Ideally, the study procedures should be presented in such a detailed way that another researcher could be able to reach the same conclusions by following them (Riege, 2003). However, if replication is or should be an aim in qualitative studies is also a debated issue in the literature (Lincoln and Guba, 1985; Miles and Huberman, 1994; Riege, 2003) Nevertheless, in order to enable a critical judgment of reliability, it is important that the research methods are described in a detailed manner.

In the present study, the reliability has been sought attended to by a thorough presentation of how the study has been carried out, and through present explanations for the methodological decisions that have been made. The reliability has also been pursued by recruiting informants with extensive knowledge of, and experience with the study's themes. Furthermore, the interview guide is available in Appendix C for critical scrutiny. In addition, the results have been critically examined by a prominent local prominent emergency preparedness leader which possesses extensive knowledge of the local context of investigation.

The researcher did not have prior experiences with the study field and may, therefore, be regarded as an outsider. Thagaard (2003) states that it is challenging for researchers to study situations of which they have little, or no prior knowledge. Therefore, conscious effort should be made to understand how the informants themselves experience their situation. Although challenging, not being guided by extensive prior experience may make the researcher open and less biased towards the data and the analysis process (Thagaard, 2003). The results are sought presented in a way that is as close to the informants' presentation of their situation as possible. That is, the categories and concepts are developed on the basis of the informants' statements about challenging aspects related communication and collaboration in an operative context. Those may not be exhaustive in relation to the real work situations, but they are suggested to capture the obstacles and hindrances mentioned in the interviews. Finally, as all summarized statements are written in italics in the result section, it should also be clear what text that is a linked to the informants' utterances and what are inferences made by the researcher.

4.5.2 Validity

In an article on the meaning of validity in qualitative research, Maxwell (1992) states that validity "is not an inherent property of a particular method, but pertains to the data, accounts, or conclusions reached by using the method in a particular context for a particular purpose" (p. 284). Mainly two forms of validity are applicable for exploratory case studies: *Construct validity* and *external validity* (Yin, 1994). Construct validity involves "establishing correct operational measures for the concepts being studied" (Yin, 1994). The concepts under scrutiny here were communication and collaboration. To get valid information about the themes of interest, mid-level leaders from EROs were recruited for interviewing. It was assumed that their occupational position and extensive operative experience provided a good basis for a valid measuring of the study themes. External validity involves to what extent the result are generalizable beyond the studied case (Yin, 1994). In case studies, the aim is usually not to generalize to other populations, but rather to make an analytic generalization (Riege, 2003). The present thesis makes no attempt to generalize the results to other populations or areas than the Sør- and Nord-Trøndelag EROs involved in the study.

5. RESULTS

In the present chapter, the results from the study will be outlined and explained in detail. The presentations will focus on barriers found relevant in limiting or hindering communication and collaboration by displaying the categories and concepts generated through the data analysis process. Throughout the presentation, it will be specified when (i.e., in which situation[s] or event[s]) the barrier(s) arise(s) and in which organizations' personnel perceiving it to be a barrier. The presentation will also state where in the organization(s) the barrier is relevant (i.e., between which organizations, organizational units or levels). Lastly, it will be specified both explicitly and implicitly if a barrier is perceived to be a latent barrier in the ERS that is manifested under certain circumstances. By being specific about these details, the aim is to provide the reader with a clear and elaborate description of the barriers generated through the data analysis.

The presentation will first list the four barrier categories and then give a definition of the core category. In the following, an overview table (table 5.1) displaying the categories and concepts and their hierarchical relations, will be presented. The table shows example quotes related to some of the concepts. This will hopefully contribute to illustrate the connection back to the analysis process. The next step in the presentation is to go through the different barriers categories and barriers by systematically defining them and elaborating on their content. In order to substantiate the understanding of the identified barriers, summarized examples from the informants' responses will be presented throughout the review.

5.1 A core category with four categories

In the analysis process, four categories became salient and seemed sufficient to encompass the emerging concepts and their linked quotes. These categories were *organizational barriers*, *ICT barriers*, *leadership barriers*, and *individual barriers*. Together, the four categories could be summed up in the core category, *barriers*, which was the intended study objective. For reasons of clarity the categories will hereafter be denoted *barrier categories* while the concepts will be termed *barriers.* Note that the name of the core category is the same as the name of the concepts. However, as the core category is the common denominator of the underlying categories and their concepts, the name sharing will hopefully not have any confusing consequences.

As mentioned in paragraph 1.6.2, a barrier is, here, defined any factor which may limit or hinder effective intra- and inter-organizational communication and collaboration in the

response phase of emergency management. The barriers may affect communication and collaboration both isolated or in interaction.

The overview table of the barrier categories, barriers and examples of summarized statements is shown in table 5.1.

Table 5.1: Four barrier categories, eighteen barriers and examples of summarized statements

Barrier categories:	**Barriers:**	**Examples of summarized statements:**
Organizational	- Lack of training, co-exercise, and multi-organizational exercise arenas - Lack of knowledge about other organizations' capabilities and requirements - Organizational instability - Unspecified organizational tasks - Inadequate notification procedures - "Tribal language"	Summarized statement coded as organizational instability: *They say they may have difficulties with manning in the summer vacation. More difficulties than we have.*[i]
ICT	- Limited robustness - Limited mobile and radio coverage - Limited radio interoperability - Limited net capacity - Low speech quality	Summarized statement coded as limited mobile and radio coverage: *Obviously the degree of coverage of our communication systems may be a challenge.*[ii]
Leadership	- Inadequate establishment of the command post - Inadequate incident command - Underestimating escalation potential - Involvement of higher crisis management levels	Summarized statement coded as involvement of higher crisis management levels: *…but now the staff apparatus is activated. You send issues over to them and don't get an answer.*[iii]
Individual	- Stress - Lack of necessary skills - Negative influence and dominance	Summarized statement coded as stress: *Until they experience that the situation becomes overwhelming (…) Then you tilt and become totally passive.*[iv]

5.1.1 Organizational barriers

Organizational barriers are here defined as aspects linked to organizational structures and processes, which may limit or hinder communication and collaboration within and between organizations.

5.1.1.1 Lack of training, co-exercise, and co-exercise arenas[48]

Factors related to training and exercise was pointed out by all informants as being crucial for good communication and collaboration, and several regarded these practices as the most essential ingredients for success. The primary area of worry expressed by all organizations was a lack of co-exercises (i.e., exercises involving multiple organizations). It was a common conception that exercises were most important for large scale extraordinary events or high risk missions such as armed operations, large accidents, dangerous goods accidents, etc. The reason for this was that normal events provided sufficient training in communication and collaboration for the organizations normally participating in such operations (i.e., the EAs). In contrast, there have been few operations involving multiple organizations and higher crisis management levels in the region, and co-exercises were regarded as a crucial emergency preparedness measure in order to manage such events if they should occur.

Apart from providing training for individuals in relevant tasks and testing of the ERS (especially functionality in rare and large events), exercises are trust- and relation building arenas. *One gets to know people's faces*, one informant uttered. Another said, *in exercises you establish relations. That's what it's all about.* Social and networking activities, including exercises, were perceived by nearly all informants as being one of the most important factors for successful collaboration. Exercises are also arenas for synchronizing organizational terminology and for participating in shared evaluations. In addition, they provide opportunities for building self-esteem, and they serve to heighten mental preparation. Nevertheless, full-scale exercises are relatively rare. Of factors that limited the rate of co-exercises informants pointed to that economic resources- and prioritizations, lack of formal

[48] Note that, unlike the other barriers, the barrier "lack of training, co-exercise and co-exercise arenas" does not manifest during the response phase. Instead, negative effects from lacks in training and exercise are believed to be central for response phase problems in communication and collaboration (Bram & Vestergård, 2011; Perry & Lindell, 2003). In addition, lack in training and exercise was believed by the informants to be a central factor that limits or hinders operative communication and collaboration. Based on these insights about the barrier's importance, an analytical choice to include the barrier was made.

frameworks and agreements, tight schedules, and the earlier mentioned belief that everyday work provided necessary exercise (i.e., for the EAs).

In relation to these topics, it is important to add that the informants said there were much more exercise and planning phase activity involving the higher organizational levels of both the EAs and SROs. In addition, there were also said to be some ”meeting places” of both formal and informal character for low level personnel arranged by the Response Personnel Forum and Norwegian Air Ambulance. However, these meeting places included mostly EA personnel.

Some also highlighted a lack of arenas for co-exercises. An informant said:

> *All the emergency agencies have high quality courses in their own training arenas. However, there are not many arenas for co-exercises.*[v]

Several informants pointed out that there had been a national arena for co-exercises at the NCD District Headquarters in Sør-Trøndelag. The NCD district had through many years run a one week course in on-scene inter-organizational collaboration, but that the course had been closed due to reorganization and economic priorities. The result was that there were currently no such common exercise arenas in the region.

In the interviews, the NHG was the only organization that explicitly pointed to lack of intra-organizational training. One officer uttered:

> *Because we don't practice as much as we used to, we need more time to get ready. When we have units that have not exercised in three or four years, it is not just to send them out on missions. They need longer time, and need to get to know each other before they are operative.*[vi]

Due to lack of training many unit leaders in the NHG do not know their personnel's capacities. The NHG informants linked low levels of training to lack of economic resources. However, an officer said that they had been promised more money and hopefully would get to train more in the future.

5.1.1.2 Lacking knowledge about other organizations' capabilities and requirements

"Lacking knowledge about other organizations' capabilities and requirements" here means that responsible EA personnel do not have sufficient knowledge about other organizations.

This knowledge can be about other organizations' capabilities (e.g., competence, material resources) and requirements when operative (e.g., information, additional resources). Knowledge about other organizations may exist in preparedness plans and action plans, but may not have been internalized by leadership personnel (i.e., the personnel responsible for ordering and using SRO resources). As a barrier, lack of this type of knowledge seems to be exclusively related to use of SROs. That is, the professional EAs seem to have adequate capability and requirement knowledge about each other, but this does not always pertain to the SROs. The NCD and the NRCSRC commented extensively about the varying degree to which the EAs did not know about their capabilities. In order to keep their organizations active and involved, the organizations regularly had to display and inform about their capabilities in exercises and demonstrations. Related aspects were also mentioned by informants from the NHG. However, the NHG was more preoccupied with knowledge about regulations for use of their personnel because regulations are strict for use of military personnel in civil operations.[49]

Some EA informants said that the barrier of "lacking knowledge about other organizations' capability and requirement" is applicable across the different types of event where the SROs may participate. However, it may seem to be most relevant for non-SAR events (i.e., as the SROs SAR capabilities are quite known). Moreover, the barrier seems most related to decisions about whether to use a SRO for support, or not. However, it was stressed that some local leaders knew a lot about which resources they had, and how and when to use them. Others did not. In other words, the problems related to this barrier varied locally.

Knowledge also involves knowing the requirements that organizations may have when operative. Talking about experiences from a large scale accident exercise an informant from the NRCSRC commented on information inadequacies:

> *My experiences from collaboration exercises are that when it's hectic, it's a challenge that responsible personnel in the emergency agencies do not understand that we need information about eventualities, like for instance danger of fire. Then we just have to pull back. We need correct information from the personnel responsible for the sector such as "if this or that happens, evacuate that way."* [vii]

[49] According to the Assistance Instruction (2003) the Norwegian Armed Forces, including the NHG can only participate with personnel in events where human life and health are threatened, or search for persons assumed to have perished.

The summarized statement indicates that responsible personnel from the EAs may not be aware of the specific informational requirements of SROs when those participate in extraordinary operations.

5.1.1.3 Organizational instability

"Organizational instability" involves several organizational aspects. The element that these aspects have common is fluctuation. Here, such factors include degree of turnover, competence level, and number of available personnel across place, time and type of event. According to the informants, the EROs vary in terms of organizational stability. The professional EAs are located on the one end of this continuum, and the voluntary organizations (in this study represented by the NRCSRC) on the other. A police officer commented on this aspect:

> *The emergency agencies, the professionals, are stable organizations. However, the volunteer organizations' personnel come and go. For instance, it may be interesting to be involved in the Red Cross for a period, and then quit. And then new personnel are recruited, or maybe no one. There are frequently new persons in the organization, or the organization shrinks.*[viii]

In this summarized statement, the police officer uses the NRCSRC to describe problems especially noted in relation to voluntary organizations. The voluntary nature of the NRCSRC means that individuals join and quit the organization regularly implicating that it is difficult for the collaborating organizations to know the exact level of competence at any given time. Some informants from the EAs told about uncertainties relating to which degree *the map resemble the terrain.* A police officer problematized the possible gap between the organizational competence that is described in plans and the real performance:

> *On paper, we know which capabilities they have, but we do not know if they are capable of delivering what they have promised. We are all individuals that are affected by impressions. And when they have rarely or never been in such situations - will they be able to live up to what they have promised?*[ix]

The informants based this type of uncertainty on experiences from operations where some organizations or organization members had not been able to provide proper services. A NRCSRC informant also commented about on this problem saying that they felt the pressure

to perform perfect each time, and was concerned that mistakes and faults would diminish trust.

A NHG officer commented on another side effect aspect of voluntariness:

> *The Red Cross is a volunteer organization. And you never know how many personnel they can mobilize. Sometimes they are few, and sometimes they are numerous.*[x]

This summarized statement illustrates the volunteer organizations' lacking opportunity to command or in other ways get people to participate in an operation. The NRCSRC informants said some larger local units have personnel in a 24-hour state of preparedness, but that this only included a small number of the NRCSRC personnel. However, one of the informants underlined that SAR-operations were children were involved usually mobilize much volunteer personnel.

According to several informants, "organizational instability" is often a hindrance or barrier for effective collaboration. Instability may undermine inter-organizational trust, and thus, frame decisions about whether to use a SRO or not. An EA informant said that when the SROs were involved in operations, their presence may create *uncertainty in the organization.* Uncertainty in the organization means that their presence both introduced more unknown elements and that the EA personnel were not that used to their presence. The informant based this view on the fact that the EA personnel respond to events and, therefore, usually very well coordinated. On the other hand, the SROs personnel are often inexperienced, and are unfamiliar both with the situation and with the ways the EAs operate on-scene. The situation may thus become overwhelming for the SRO personnel.

5.1.1.4 Unspecified organizational tasks

"Unspecified organizational tasks" denote that some organizations do not have pre-designated event specific tasks and roles. In contrast to the three EAs that have clearly defined tasks and roles across operations, some organizations do not always have such work organization. This type of barrier pertains to the SROs when participating in unfamiliar events (i.e., unfamiliar for the SROs) such as for instance large accidents. In SAR operations, where participation from the involved SROs is most common, they all constitute SAR-units searching for the missing person(s). This is also the case if a specific resource (e.g., water pumps, Mobile Decontamination Teams) is ordered. However, in many other operations they do not have such pre-designated tasks. This flexibility constitutes an extra challenge on-scene as they have

to get tasks or missions delegated from responsible EA scene commanders. A police officer said:

> *Volunteer organizations and the Civil Defense do not have specific tasks in accident situations. They have to get delegated tasks such as, for instance, helping the health service with carrying patients, or helping the fire- and rescue service with equipment such as lights and water. So it becomes a challenge to lead them. This is no challenge when they're not involved. Then we just talk together, and things work out by themselves.*[xi]

As the police officer points out, lack of specified organizational tasks in accidents may become a challenge for on-scene management. The responsible leaders have to command the SROs' personnel what to do, and, thus, they get extra tasks to keep track of. The barrier of "unspecific organizational tasks" was also linked to the creation of uncertainty in the organization.

5.1.1.5 Inadequate notification routines

"Inadequate notification routines" denote that organizations are notified late or not notified at all. This barrier is primarily linked to the notification of the SROs, and it seems to be relevant across event types. The standardized procedure "triple-warning" is used for notification between the EAs (i.e., if the event is not deemed adequately managed by one EA alone the first centre getting notified about an event immediately notifies the other two EAs). However, there are no standardized routines for notifying the NHG, the NCD, and the NRCSRC. According to informants, the main problem is late notification. By being notified late, the SROs response time increases. The "inadequate notification routines" barrier was said to be located in the communication between the coordination centers and the SROs (as the police have the cross-sectorial leadership in emergencies they are the organization that most often notifies the SROs in multi-organizational operations. Therefore, this problem primarily involves the police operations centre). An informant from the NRCSRC said:

> *When something extraordinary happens, and it's really "hot" at the police operations central, it may take some time before they find out that they require our support. That's a challenge for FORF.*[xii]

The summarized statement illustrates that late notification may be linked to the high workload at the police operations centre in the acute phase of an event. Another informant, a NHG officer, commented on similar matters:

> *Considering the utilization of the Home Guard, getting early notification to react; to really be able to provide some sort of support, is a challenge.*[xiii]

The SROs need time to mobilize and react. When notification comes late, the overall efficiency is decreased by postponed arrival on-scene. Some SRO informants thought it would be a good idea that the police forewarn that they may be planning to use a SRO even if this is not certain. Furthermore, the informants considered if the police ought to have procedures for forewarning. An informant uttered:

> *They [the police][50]do not need to say "come immediately" because that's what happens – "can you come immediately? Preferably you should have been here an hour ago." They need just to inform that there is an event going on.*[xiv]

If forewarning had been a standardized procedure the SROs could have started notifying their personnel earlier, thus, being better mentally prepared and able to react quicker when support was actually requested. Informants from the NHG also commented on not being notified at all, and thought that the threshold for their use was too high. There were comments about being placed after the volunteer organizations and the NCD on the police's notification list (i.e., list meaning usual notification pattern). The NHG informants claimed that reasons for this could lie in both traditions and that they were more expensive to use than the other organizations, especially the volunteers.

5.1.1.6 "Tribal language"

By "tribal language" it is here meant the specific organizational terminology used to describe phenomena in the world. Different organizations or organizational subdivisions may use different words to describe the same phenomenon, or use abbreviations and "codes" known and mastered solely by members of the organization or unit. "Tribal language" as a barrier becomes most evident in the specific practices constituting the interfaces between organizations such as radio communication and operative collaboration where personnel from different organizations are collaborating in close physical proximity.

[50] The police are responsible for requisition of the NHG in peacetime operations (NNPD, 2011).

The consequential severity of "tribal language" as a communication and collaboration barrier was said closely connected to event specific factors. That is, according to informants, "Tribal language" did involve serious difficulties in operations where there is sufficient time, low risk, and low stakes. As one informant said, *we all speak Norwegian* meaning that possible misunderstandings will be solved by conversation. The informant underlined this by saying, *you can always ask.* However, when time is short, and stakes and risks are high, "tribal language" may, in a worst case scenario, be a matter of life or death. Especially, informants from the NHG were concerned about the organizationally specific terminology used in joint armed operations with the police. Although the NHG-district had not participated in real life armed operations, they pointed to experience from armed mission exercises with the police. In these exercise operations, differing terminology had been shown to be a barrier. One informant said:

> *In armed missions one has got to be very careful about what is said - what one means with words. In recent years, we have become very conscious about terminology. For instance, if the police use words like "fight" or "neutralize". What do you mean by "neutralize"? This is command language. It should be precise. There shouldn't be any room for doubt. You have different cultures when it comes to terminology, so you should be careful. I have experienced this. However, it has improved.*[xv]

The informants from the NHG stressed that they had become more conscious of terminology and that matters linked to "tribal language" currently had improved a lot compared to the past. At the same time, they also said that due to little co-training (i.e., between the NHG and the police) combined with high rates of internal turnover in the NHG, the issue was ever present and relevant. A common conception was that co-exercises are a prerequisite for "synchronizing" terminology, and getting a better understanding of other organizations or organizational unit's "tribal language".

Differing use of language does not only follow organizational borders, but may also be a communicational barrier between organizational subdivisions. An informant from the NHG commented on this:

> *There are also different uses of terminology inside the armed forces. The [NHG] marine forces have for instance a different way of communicating on the radio than us. However, we get to understand each other.*[xvi]

5.1.2 Information and communication technology barriers

The ICT barriers include lack of availability of ICT, limitations in ICT, and ICT malfunctioning which are perceived to have negative impacts on communication and collaboration in a response setting.

5.1.2.1 Limited robustness

"Limited robustness" involves an ICT system's inability to tolerate high levels of strain. This barrier may pose a challenge to all communication both within and between organizations. In the interviews, "limited robustness" was most often linked to weather conditions. That is, difficult or extreme weather conditions may, either in themselves (e.g., hurricanes, extreme temperatures) or through secondary effects (e.g., avalanches, landslides, floods), cause a breakdown of communication systems, or failure in the electrical system (i.e., as the electrical system is a prerequisite for using many communication systems). Thus, "limited robustness" may affect ICT communication in all events under these conditions in a very widespread and serious way. One police officer commented on this aspect:

> *We have so much crap that originally is made for functioning under normal conditions. Problems may arise due to rain, storm, landslides/avalanches and failure of the mobile; the systems are fragile.*[xvii]

Several informants spoke of an increasing reliance of communication systems vulnerable to environmental strain. The mobile net was the main focus of their worries. For instance, an informant talked about a major fire which had occurred during a telephone net breakdown. In this incident, the local FRS were unable to call for back-up as they could not reach the neighboring FRS'. The informant concluded that this was because of the agency had been relying too heavily on the mobile phone system.

Other informants also expressed worries about potential future problems. They thought that "limited robustness" most certainly would continue to be relevant in future emergencies. Some even worried that the problem would increase in both frequency and severity as they linked this type of vulnerability to hazards predicted to increase due to climate change.

5.1.2.2 Limited mobile phone and radio coverage

Having sufficient signal coverage for using ICT is highly important in order to enable effective communication and collaboration. Informants from all organizations mentioned

"lack of radio and mobile coverage" as being a considerable challenge to effective communication.[51] The radio communication equipment used in the involved organizations was described as old and analog, providing somewhat poor opportunities to advanced communication.[52]

"Limited radio and mobile phone coverage" most directly affects communication between operative field units by limiting the ability to communicate with the coordination centers, and between each other. The barrier is thus linked to both intra- and inter-organizational communication. However, in general the radio coverage is better on the intra-organizational nets in the EAs than on collaboration channels. This difference will be addressed in more detail later.

"Limited radio and mobile phone coverage" is heavily related to the specific location where an event occurs. Such factors include geographical remoteness, sparsely populated areas, challenging topography, and tunnels.[53] In these circumstances, "lack of mobile phone and radio coverage" often becomes a barrier. An informant commented on lack of coverage:

> *An obvious challenge is areas with very poor radio and mobile phone coverage. (…) I think everyone has poor coverage in some areas of their districts. Then you have nothing, and you're on your own.*[xviii]

SAR operations do often occur in remote and topographically challenging areas, and these where expressed to be especially relevant for this barrier. In these operations, some informants referred to "limited of mobile phone and radio coverage" as "the big one" (i.e., in terms of communication and collaboration challenges). However, in such events a

[51] The coverage on radios and mobile phones differ in many respects. However, as the problem of interest here is limited coverage they are considered to belong to the same barrier.

[52] The radio nets used in most parts of Norway are organization specific. That is, each organization use their own nets. And the nets thus vary in terms of coverage and have limited opportunities for interoperability (see section 5.1.2.3) (NDEC, 2007). A new emergency communication net (TETRA-net) enabling seamless communication between the three EAs is currently being built throughout Norway. At the time of the interviews, neither Sør-Trøndelag county, nor Nord-Trøndelag county, had acquired the TETRA-net. However, some units in Sør-Trøndelag had participated in a TETRA pilot project and thus had experiences with using the net. Today (01.11.2013), only some districts have a fully operative TETRA net. The new net project is set to be finished in 2015 (MJPS, 2012).

[53] In Norway, there are in total over thousand tunnels in road net (Kveen & Lindstrøm, 2011).

NRCSRC informant said that it was sometimes possible to apply mobile repeaters to increase radio coverage.

The designated inter-organizational collaboration channel (i.e., the channel used by the police, the FRS, the HS, the NRCSRC, and the NCD in collaborative operations).[54] "Rescue 1" seems to be especially problematic in terms of coverage. "Rescue 1" relies on a single frequency system. An informant commented on the problems linked to "Rescue 1".

> *Using rescue channel one may be a challenge. It is a single frequency channel, meaning that the signal only is transmitted between radios. It doesn't transmit via base stations.*[xix]

Single frequency means no base stations or mediators are used for signal amplification. For direct inter-organization communication (i.e., between field units) to be possible, the field units need to be quite close physical proximity to each other, and are dependent on relatively open terrain between the radios. Limited coverage on "Rescue 1" may especially be a problem under transportation to a scene, as it limits the ability to communicate between the operative field units.

The consequences of the "limited mobile phone and radio coverage" barrier vary with both type of event and type of lacking information. For instance, if limited mobile coverage causes the coordination centers not to get sufficient information of an accident, the EA personnel may have to travel to the scene without sufficient mental preparation. Or, if the EAs, because of lack of coverage on "Rescue 1", cannot communicate inter-organizationally during transportation, it may be difficult to discuss mission solving prior to arrival. Both these scenarios may affect the readiness upon arrival and limit the efficiency of collaboration with other units. However, the personnel were said to be applying "what-if" scenario thinking in order to compensate for lacking information.

5.1.2.3 Limited radio interoperability

"Limited radio interoperability" involves communication ICT systems not being compatible with one another (i.e., separate nets), or the use of organizational specific radio channels for communication. This barrier is, therefore, first and foremost linked to inter-organizational

[54] The NHG uses a communication system not compatible with "Rescue 1".

communication. As a barrier, "limited radio interoperability" is general in that it may be relevant all event types. However, the specific consequences may vary across events.

When organizational units are in close physical proximity in light terrain, they may use "Rescue 1". Moreover, in some tunnels the collaboration channel, "Rescue 2". However, in tunnels where a radio communication system is installed, it is only applicable to the EAs, and the coverage is limited to tunnels and 40-50 meters outside the tunnel. However, to enable inter-organizational communication, the personnel must switch from a separate intra-organizational channel to the common inter-organizational channel "Rescue 1". Thus, in order to get all relevant information the personnel have to switch constantly between the channels or, alternatively, listen to several radios simultaneously. This situation may be problematic as one may not happen to be listening to the right channel at the right time, as well as it adds an extra work task in an already often challenging environment (e.g., high stakes, uncertainty, time-pressure).

In open air, when there is a larger geographical distance between different organizational units, the personnel in the field must use the coordination centers as intermediate steps for conveying information to the other EROs. The probability for information to be distorted is thus increased. Note that inter-organizational communication using the coordination centers as intermediate channels is only possible for the organizations being direct linked to the centers through their radio nets. Whenever there is sufficient radio coverage the EAs have such a link, as do some of the SROs. For instance, the NRCSRC may connect to the health service net, and the NCD which may connect to the police's net. However, these interoperability opportunities vary locally.

Contrasting the analogue net with the new TETRA-net a FRS officer described a possible consequence of "limited radio interoperability" as a communication barrier:

> *Yes, the emergency net [TETRA], when it is implemented, then you have means for communication. Then you cannot say "I didn't get to give you the message, I didn't reach you on the radio today." And so, for instance, the health service didn't know about the gas-leakage, and they drove right into the gas cloud, which is a frightening scenario. In this example, the crucial information the fire- and rescue service had*

wasn't conveyed because there were no means for communication between the organizations. [55] [xx]

In the FRS, "limited radio interoperability" was also said to be an intra-organizational communication barrier. In fires, smoke divers use a special radio system for communication. When smoke diving they only communicate with the smoke diver leader outside the building, and, therefore, cannot convey direct messages to the FRS scene commander. In situations where the smoke divers are in need of conveying information to the on-scene leadership, the information have to pass through intermediate channels (i.e., here, the hierarchy of on-scene FRS officers). This possible complexity may also be even more increased by the fact that the FRS scene commander is destined to listen to several sources of incoming information simultaneously (i.e., the FRS' channel, "Rescue 1" or "Rescue 2", and mobile phone), thus decreasing the ability to fully process the incoming messages (e.g., experiencing information overload). However, if it was evident that the event was very large and demanding, the FRS scene commander delegated the communication responsibility to a designated communications operator.

In contrast to the FRS officer quoted above, some informants were concerned about the potential consequences of the future implementation of the TETRA net. Although one of the most important purposes of the TETRA net is to increase interoperability, the system may create new barriers for other EROs. An informant from the NRCSRC said:

A great possible challenge, in terms of collaboration, is FORF not getting to use TETRA, or get TETRA covered [economically]. If this happens, and all communications goes through TETRA, none of the volunteers are in. That means that we have to use a mobile phone to reach the medical emergency communication central. They must call us, and there may be no coverage at that spot. Or we drive a snowmobile and cannot hear the mobile ringing. That is a worry that has been uttered by the Norwegian Red Cross concerning the search- and rescue corps. We would still have our own radio communication system, but it is difficult to collaborate with others when we cannot efficiently communicate with them.[56] [xxi]

[55] The FRS informant was able to contrast the two systems as the officer had participated in the TETRA-net pilot project which was carried out in the in the Trøndelag region from 2000 to 2003.

[56] This quote could also have been coded as an organizational barrier. However, because of the possible loss of radio connection opportunities it represents, it is here coded as an ICT barrier.

The summarized statement illustrates that while the TETRA implementation eliminates interoperability problems, it may also create new ones.

5.1.2.4 Limited net capacity

The analogue radio communication systems have a very limited net capacity. "Limited net capacity" here means that the radio communication systems only allow one person to transmit on the radio at a time. The rest of the involved net users cannot interfere and thus have to wait until others have finished the transmission. This problem pertains to all operative field units, and between units and communication centers. Although being a quite general barrier in the organizations, personnel from the health service was especially preoccupied with the problem as they often have to convey longer messages about the patients' medical conditions. Therefore, "limited net capacity" may be an especially potent barrier in events involving mass injuries. One health service informant uttered:

> *… too many people on the net. Things like that. All messages must be conveyed through one radio channel, both reporting from the car [ambulance] and everything else. It can be a capacity problem. It's totally clear that there are gaps.*[xxii]

In relation to radio communication, the capacity barrier seems to be at least two-folded involving technological system and situational components. That is, it involves the intrinsic limitation in the system and event specific characteristics demanding frequent or long messages within a limited time frame.

5.1.2.5 Low speech quality

Low speech quality on the radio net may be a barrier for communication. As a barrier "low speech quality" is relevant for all personnel on the radio system. The barrier is most evident in environments with high levels of noise. Fires may, for instance, constitute such an environment. A FRS officer uttered:

> *In fires noise linked to the radio communication through the emergency net is a communication problem. The radio communication system is analogue. It is old. The speech quality may be bad. We cannot understand what others say.*[xxiii]

When speech quality is low, a receiver may not be able to understand or may misunderstand, what is sought conveyed.

5.1.3 Leadership barriers

Leadership barriers are here defined as factors linked to leadership which may limit or hinder communication and collaboration in operative emergency response. Leadership has a structural and a process dimension in that the barriers may be found both in the leadership structure and in the person(s) exercising the leadership.

5.1.3.1 Inadequate establishment of the command post

A reoccurring theme from several informants was "inadequate establishment of the command post". Here, this means either that the EA leaders are not gathered in a physical location on-scene (i.e., a command post), that the establishing the command post is postponed, that the command post is only established in some type of events, or that the command post is not maintained throughout the response. One police officer said:

> *A challenge on-scene is to get the functions [on-scene leaders] to be at, or have a command post (…) that they are together and talk together. That our incident commander is together with the fire- and rescue service scene commander and the ambulance scene commander.*[xxiv]

Another informant uttered:

> *The challenge is that the emergency agencies [i.e., their on-scene commanders] are failing to establish a command post. They are as close to the scene as possible, running in between each other. And it happens time after time. That's a problem for the field personnel.*[xxv]

In terms of event type, "inadequate establishment of the command post" seems to be especially related to non-SAR events of a certain scale and magnitude.[57] For instance, informants mentioned tunnel events and fires mentioned. An informant commented on the problem in tunnel events:

> *I've attended evaluations of three or four tunnel accidents- and fires where a command post establishment was absent. It hasn't necessarily gone wrong, but they were lucky that it didn't. If the fire had been larger rescue personnel could have been lost, or one would not have had control over where they were.*[xxvi]

[57] In SAR-operations different type of command post is used (NMJP, 2008; see paragraph 3.4.2).

According to informants, the on-scene leadership personnel are often close to their own organizations' unit, instead of being together. The physical distance means that they cannot speak directly to each other and are, therefore, dependent on using radios and mobile phones for communicating. A SRO interviewee described an event where different on-scene commanders were scattered around the scene close to their own personnel. Leaders thus had to search for one another on-scene. Another SRO informant said that the command post barrier had been in focus of attention for some time. Nevertheless, the failing to gather together in the command post, and doing so rapidly (i.e., upon arrival), kept reoccurring both in exercises and real-life events. However, EA informants said that the problem had improved the later years and that now (06.2011) it happened only rarely. Although informants from both the EAs and SROs mentioned inadequate command post establishment as a barrier for communication and collaboration, the interviews the informants from the SROs seemed to be the most preoccupied with the problem. Some of these informants said that a poorly defined command post had sometimes been a big problem for their on-scene leaders.

Even though informants seemed to disagree about the frequency and development of the problem, they agreed on the importance of a command post establishment. One informant highlighted the need to practice the command post establishment in a variety of scenarios in exercises. Interestingly, practice and experience may also partly be an influencing factor of inadequate command post establishment: The EA leaders' work experiences are to a large degree constituted by years of carrying out practical tasks. It was stated that the transition to an EA leadership role may in some cases be problematic, a phenomenon informants called *being too operative.* Being too operative means leaders who engage in practical, operative tasks instead of "pulling back" to coordinate and lead the on-scene operations.

One informant also commented on that even when the command post had been adequately established, it often ceased to be operated when the danger, in terms of life and health, was over. The necessity of a command post continuation throughout the response, and not abolishing the function when the most acute phase was over, was underlined. The informant thought that a clearer focus on command post maintenance could have improved collaboration both within and between organizations in the non-acute phases of events.

5.1.3.2 Inadequate incident command

"Inadequate in incident command" here involve three aspects: Structure, inclusion and planning. From the interviews, all these aspects seem closely linked to the personal qualities

of the incident commander present on-scene. By having the cross-sectorial leadership authority on-scene, the incident commander is a prominent character in emergency management. However, it was stated that the way an incident commander exercises his or her leadership sometimes is deficient. An informant said:

> *It is very dependent on the personal qualities of the incident commander – if he applies a structured approach or is a "cowboy". That the incident commander does a good job is in principle crucial. If he doesn't, it's really tough for the personnel.*[xxvii]

In relation to communication and collaboration efficiency, lack of structure seems to be relevant across event types. A lacking structure may, in an operative field setting, mean deficiencies in organizing the scene such as not separating sectors adequately, not having an adequate organizing of injured, etc. However, one aspect was especially highlighted and involved the degree to which the incident commander applies a structured approach to operating the command post. The meeting structure was, for instance, mentioned as an area in need of improvement. One informant said:

> *Repeated structured meetings with a clear and known agenda, and which in the next step, is followed-up on-scene, is a core point and area of improvement. If I was to bet, I'd say it's a problem throughout Norway. I'd bet a year's wages. I have twenty years of work experience and it happens time after time.*[xxviii]

The summarized statement shows the informant is quite critical to some of the ways incident command is carried out on-scene. This may an indication that the procedures for incident command may have deficiencies. One informant commented on similar matters saying that some incident commanders' approach to leadership lacked a clear methodology.

Another main issue linked to "inadequate incident command" revolved around a lack of inclusion of the collaborating organizations in the command post. That is, does the incident commander prefer to have the leaders or counselors from other organizations physically close-by (collocated work), or does he or she prefer to work in relative isolation and primarily using radio for communication with collaboration organizations (distributed work)? A NHG officer uttered:

> *Depending on experience and personality, some leaders want to lead having the counselors close-by. Others want a model where they're further away, and in a worst case scenario, not having counselors at all. If I am the Home Guard on-scene*

commander leading a hundred soldiers out in the woods, that's very unfortunate. The communication lines are broken if you're located in another building or car than the incident commander. You do not know the status and don't get a shared situation picture.[xxix]

According to some informants from the SROs, not including collaborating organizations in the SAR command post is a reoccurring issue. Lack of inclusion was said to be related to various problems such as organizations feeling they do not get to use their expertise adequately*, not getting into the police's "decision-loop"*, not getting to listen to the overall radio communication, being unable to *look at the map and understand what's going on*, not getting a shared understanding of the situation, etc.

Planning is also a crucial task included in incident command. Planning involves thinking proactively, the ordering and use of resources, organizing personnel replacement, etc. Although planning is a general necessity, its importance increases when the operation is large (i.e., involving a large number of personnel) and long-lasting. Several of the informants expressed problems related to planning deficiencies. For instance, a police officer commented on an incident commander's responsibility in planning the use of external resources:

When an incident commander orders a resource [a SRO], they have to think through how they're going to use them. That can be a challenge and is an area of improvement.[xxx]

The importance of good planning was exemplified with situations where NCD-units are involved. The NCD often use large vehicles and are thus in need of considerable space for operating. For optimal efficiency, this is something that must be thought through before the units arrive. The NCD also has Mobile Decontamination Teams for cleansing people exposed to chemical contamination. These teams' equipment needs water in order to function. Such additional requirements need to be thought through. In sum, this highlights that requirements linked to rather rare events also have to be planned for and underlines the need to consider the totality of resource requirements.

Planning also involves timing. If planning is postponed, it may result in delays. One NHG informant commented on this issue:

When the night comes, it gets quiet. Nothing happens. And then you meet the next morning. Instead of starting planning new missions then, they [the SAR teams] could

have been given the mission at ten p.m. the night before. In that way, the personnel could have started preparing for the next day and be operative already at dawn. You would also avoid wasting time on planning in the morning.[xxxi]

The summarized statement indicates that planning for the next day already the night before may be an area of improvement. Like lack of inclusion of collaborating organizations, this problem was said to vary with the incident commander. Sometimes planning is done at night, sometimes it is not. Some informants expressed that level of experience may be an influencing factor for this problem.

In long lasting operations, planning also involves personnel replacement. Leaders need to think proactively about who is going to take over when the personnel are exhausted, or their work shifts are over. According to some informants, personnel replacement may act as a barrier since this planning is not always adequately executed. The informants did not elaborate much on the connection between personnel replacement and collaboration, but it may be assumed the problems may be linked to exhaustion of personnel, information exchange, etc.

Here, it is important to add that informants underlined that incident command, with respect to structure, inclusion and planning, often was conducted in a very satisfactory way. However, it was also said that there were extensive variations. The variation could occur both across operations and within the same operation. While addressing long-term operations one informant commented on the changes that could vary due to the work shifts of the incident commanders.

Much can change with new work shifts. The new commander may have a totally different attitude and the way of doing things. The leadership system in the police are not unified enough.[xxxii]

Police informants said that, in the course of the last decade, standardized educations for incident command have been established. This also involves somewhat standardized practical approaches for exercising incident command (e.g., event specific action plans). Nevertheless, in some cases, personal preferences and style still seem to be dominating.

5.1.3.3 Underestimating escalation potential

"Underestimating escalation potential" means that leaders misjudge an events' potential to escalate, and the phenomenon here pertains to responsible on-scene commanders in the EAs (i.e., as the on-scene commanders are responsible for scaling the operation within their own professional areas in accordance with the situational demands). According to the informants, commanders are most prone to underestimate the escalation potential of events starting small and then growing in scale and severity. One informant uttered:

> *Upon arriving on-scene, a problem may be that you underestimate the inherent potential of the situation. You take care of the situation as it is and do not think about its future potential. The scene may escalate. (…) For instance, you may underestimate the scaling of resources. This may lead to loss of life. For instance, poor organization of the gathering area for injured may lead to losses.*[xxxiii]

Judgments about escalation pertain to different events and situations, and may involve various dimensions (i.e., timing, scaling, etc.). For instance, in some events it may involve not organizing the scene sufficiently. However, the "underestimating escalation potential" barrier was most often mentioned in relation to fires. An FRS officer said:

> *Often there are challenges in the acute phase when coming into the border area between normal and extraordinary measures, such as mobilizing the staff and taking measures for being able to keep the operation going over time. The situation is acute, and people are fighting for your attention. And then suddenly you realize you haven't activated measures for enabling continuation over time.* [xxxiv]

The summarized statement illustrates what essentially may happen when an event's escalation potential is underestimated: The organizational resources (i.e., material resources, personnel, expertise etc.) needed to manage the event lags behind the event escalation.

Underestimating an event's escalation potential may have different consequences for both intra- and inter-organizational collaboration. Mentioned examples were postponing the notification or ordering of external resources, postponing the staff establishment, and not establishing a sufficient management organization on-scene in time.

5.1.3.4 Involvement of higher crisis management levels

When an event cannot adequately be managed by normal line-management, crisis management levels are introduced on the initiative of the organizations' superior leaders. The crisis management levels (i.e., operational and strategic) are supposed to provide coordination support for the operative personnel (i.e., the coordination centers and the field personnel). However, the support does not always function as intended, and this may in some cases have a negative impact. This problem was only mention by informants from the police. Involvement of crisis management levels appears primarily to affect the vertical intra-organizational communication and collaboration in the police, or more specifically, the communication and collaboration between the incident commander, operations leader and the operational staff. One police officer said:

> *The personnel working daily in handling events get very good and coordinated. They dare to make decisions. When higher levels are present decisions are brought up to them, and they are not used to take decisions in the same way. They become hesitant, and the result is the lack of decisions. This is what we experience when a larger staff apparatus is involved. They are supposed to be supporting, however, the personnel handling events on a daily basis may experience their presence as limiting.*[xxxv]

The barrier seems not to be specific to any event type. That is, as long as the event is too large and complex to be effectively managed by the line management, and higher crisis management levels are introduced, the barrier may manifest. The higher levels are seldom activated, and the activation seems to create confusion about tasks and roles. To some extent the responsibilities seem to become unclear for the involved leaders. For instance, may the incident commander or operations leader send decisions they normally make together, up to the higher crisis management levels. An informant said that *they [the incident commanders] experience or feel that the decisions lie higher in the system.* Simultaneously, officers in chief of police's staff at the operational level may also engage in micro-management:

> *The staff members that are supposed to take the strategic decisions get involved in detail management. They are not used to the situation, and they don't think or don't believe that the incident commander, or the operation central in collaboration with the other emergency agencies, handles the situation. They get involved in matters they shouldn't get involved in.* [xxxvi]

In the cases described, the collaboration between the incident commander, the operations leader and the higher crisis management level seems to represent an interaction which may decrease the quality of the collaboration. A police officer also said that even though roles and tasks specific to the levels are quite clearly expressed in plans and manuals, and also told and retold to leadership personnel on the relevant levels, the problem *keeps reappearing every time a major event happens* (i.e., every time the crisis management apparatus is introduced).

5.1.4 Individual barriers

Individual barriers here mean aspects linked to the individual that may act as a barrier for communication and collaboration within and between organizations.

5.1.4.1 Stress

The barrier "stress" is a result of the interaction between the individual and the environment, and means personnel being overwhelmed by the situation which may lead to decreased cognitive capacity and problem solving abilities. When stressed, people may get *caught by the situation.* Stress may arise when many things are happening simultaneously, the situation is critical or when demands override perceived personal capabilities. Several informants used similar examples to describe the barrier "stress" in operative situations. One police officer's comment exemplifies this:

> *Stress may cause leaders to get involved in concrete and simple tasks, rather than leading. For instance, an incident commander may engage in directing traffic. Or, the fire- and rescue service scene commander may engage in fire extinguishing. In other words, he gets so stressed.*[xxxvii]

The summarized statement shows that stress may cause personnel, here exemplified with leaders, to engage in tasks not efficient for the operation effectiveness. Instead, they may turn to known and safe tasks in which they have extensive experience (over-learned behavior). It was also reported that stress can create "tunnel vision" making people becoming too focused on the event. Being too focused on an event may result in limited communication and collaboration in different ways. An example is to postpone the ordering of resources or activation of the crisis management apparatus. Another example involves decreased ability to receive, process, and send new relevant incoming information. One informant commented on the latter example:

> *We are good at communicating warning, but then we may get too focused on what has already happened. And, I question if we are good enough at communicating in the later stages of the event. For instance, are we good enough at distributing important incoming information? This may be worsened by rapidly unfolding happenings.*[xxxviii]

When describing a possible problem at the police operations centre the police officer points to how rapidly unfolding happenings are combined with the personnel's too strong focus on the unfolding events. In the next step, this may spill over to deficiencies in communication or decrease the ability to act on new incoming information. A mentioned example was drawn from train accident exercises and related to the distribution of incoming information from the train controller centre about dangerous goods. The earlier mentioned police officer questioned the ability to distribute such information under stress efficiently. However, it was pointed out that this problem not only could occur at the coordination centre, and that exercise evaluations had shown that the on-scene information management also suffered in stressful situations.

Some of the EA interviewees said that SRO personnel were more prone to stress as they were not involved in handling events on a daily basis. Because of this lack of exposure to real situations, they were said not to be sufficiently mentally prepared. The volunteer organizations were especially mentioned as being problematic in terms of stress. A factor that underlined this was that many of the volunteer organizations' personnel are very young and inexperienced. Knowledge of this *stress syndrome in support organizations* may lead to that the EAs decide not to use the organizations in certain missions. In the interviews, some of the EA informants said that experiences from exercises involving major accidents (i.e., events where the SROs are rarely used) had confirmed the stress syndrome in SROs. However, also in SAR-missions, especially in districts with few operations, the problem had occurred. An informant reported that is such areas the "stress syndrome" sometimes was equally for the EAs.

Although the phenomenon of stress is somewhat general in terms of individuals in organizations and organizational levels, stress is most often evident in the most critical phases of a response. Moreover, stress seems to be closely linked to the degree of experience in carrying out certain work tasks.

5.1.4.2 Lack of necessary skills

"Lack of necessary skills" involves that individuals do not have adequate levels of relevant skills to communicate and collaborate effectively. One type of skill that sometimes is missing is technical skills for using the radio. Not being able to use radio channel "Rescue 2" properly (i.e., the radio channel for use in tunnel events), was mentioned as a skill where there sometimes were inadequacies. One police officer said:

> *Personnel say that the radio channel we use for communication in tunnels, 'Rescue 2', doesn't work. And then we test it, and it works perfectly fine. The problem is that they use it so rarely that they do not know how to use it.*[xxxix]

The summarized statement illustrates that lack of skills in using the specific radio channel may make personnel unable to communicate in tunnel events.

According to one informant, not having sufficiently achieved technical radio skills in general may cause personnel to *use their mental capacity on radio matters.* The personnel may believe that their skills are adequate, but when confronted with a very stressful situation they may discover that they are unable to use the radio efficiently. In the next step, this may affect collaboration and the management of the event. Another similar was problem reported by the HS. Radio operators sometimes used too long time to convey messages on the radio. As the radio net only allows one operator speaking at one time, the excess chatter may hinder or delay communication.

5.1.4.3 Negative influence and dominance

"Negative influence and dominance" here involves personnel being dominating in a negative manner. As a barrier, "negative influence and dominance" means being too substantial in asserting propositions not being anchored in collected information, taking own initiatives that are not clarified with the on-scene leadership, and acting in ways attracting unnecessary attention. The superior on-scene leadership may in these examples be evaded. This phenomenon was especially mentioned by informants from the NRCSRC and was related to experiences from some SAR-operations. The barrier of "negative influence and dominance" seems to pertain to the on-scene leadership collaboration both within and between organizations. An informant said:

> *I have experienced that both our own elderly members and other organizations have talked to the police about a hypothesis without having the collected information and*

knowledge that we [the NRCSRC on-scene leadership] have. They try to sell the idea to the police, without talking to us first.[xl]

This summarized statement shows signs of negative influence by attempts to evade the on-scene leadership. It was stressed that the type of actions was often done in good faith. The negative consequences could be that different units have different situational understandings and, therefore, will be *pulling in different directions* or starting uncoordinated searches of areas which, in the next step, would limit the overall effectiveness. One informant referred to this phenomenon as *an extra command post*, and said that when this had happened it had been a source of conflict within the on-scene leadership. Another informant linked dominance to the level of experience. That is, many incident commanders do not have sufficient experience in leading larger groups of SAR-personnel and some lack personal authority. It was stressed by several informants that, because of the large number of personnel involved SAR-operations needed incident commanders that radiated a clear and strong authority.

When a situation is acute negative dominance can also unfold in a more indirect way by personnel *claiming their needs as being the most important*, and thus, directing attention away from more important tasks. For example, one FRS officer said that *the ones shouting the loudest you have to speak with first.* This latter phenomenon was also reported by other informants.

6. DISCUSSION

The primary aim of the present thesis was to identify and describe communication and collaboration barriers as perceived by twelve mid-level leaders from six key EROs in the Sør- and Nord-Trøndelag counties, Norway. The analysis of the interviews identified four distinct barrier categories and a total of eighteen barriers which, in various ways, may limit or hinder operative communication and collaboration in within and between EROs during emergency response. All the barriers were systematically presented in chapter five.

In the following chapter, the results will be discussed. The chapter consists of three main parts. The first part will address the reliability and validity of the results. The second part will be a case discussion where the results are addressed on a rather concrete level. Here, the main tendencies and patterns linked to the EROs and their interactions will be pinpointed while some reflections are added. The final part, the general discussion, takes a theoretical approach to provide a wider understanding of barriers and dwells on how the barriers may be reduced or eliminated.

6.1 Reliability and validity

6.1.1 Reliability

The reliability of the present study has been attended to by careful description of the research process, as well as the methodological decisions taken (see chapter 4). However, some issues need to be attended to in more detail.

The first of these issues involves the interview guide. As mention in paragraph 4.2.1.1, an interview guide can vary in terms of structure (i.e., from open to structured). The present interview guide was developed with relatively few open-ended questions as contents. Some may, however, argue that a more structured interview guide, which was more rigidly based on prior research, would have been a more favorable approach. However, due to the case-study's exploratory focus, it was regarded as essential to allow the informants to focus on the aspects that they thought were most important, and, further, to allow the exploration of unexpected issues. As Marshall and Rossman (2006) claimed about expert informants, the interviewees seemed able to handle broad open-ended questions well, and most informants reflected both broadly and in detail on relevant matters. Moreover, the fact that informants from different organizations repeatedly brought up the same or similar problems may indicate that they had a good overview of the problems shared.

A second point that is linked to the data's reliability is the interviewees' relation to an operative context. More specifically, the informants that participated in the study had different roles and tasks in relation to the themes under scrutiny (i.e., operative communication and collaboration). However, two common features were that they were all mid-level leaders with extensive operative experience and were still involved in operative work and exercises on a regular basis. Their knowledge about the themes in question, therefore, could be assumed to be adequate. It may be imagined that interviewing purely specialized operative personnel would have yielded more detailed descriptions on some of the barriers. On the contrary, it is also reasonable to assume that such an alternative and restricted selection would have been on the expense of the richness of description of other important study results (e.g., organizational structure, ICT infrastructure, etc.).

Reliability also concerns whether the information provided in the interviews can be regarded as trustworthy. That is, are the interviewees telling the truth, or are there reasons to believe that certain information is withheld or distorted? There have been no apparent cues that indicate that relevant information consciously have been withheld or distorted. However, some of the involved EROs' work tasks and operations involve sensitive information, and it is possible that some information is classified by law or believed to be so by the informants. Consequently, in reality, there may be more problems than the ones stated in the interviews, or some of the problems identified could be more severe or differently composed than the informants revealed. Another factor that potentially may affect the data's trustworthiness is the *social desirability bias* (i.e., the tendency to present oneself or one's group in a favorable way). In the present context, the social desirability may be best thought of as two-folded, having both an organizational and an individual dimension. Firstly, as the informants were recruited on the basis of their organizational membership it can be imagined that they were motivated to portray their organization in a favorable manner. Secondly, the individual dimension can be regarded as another, though closely related, type of the social desirability bias; employees may form professional identities with emotional connotations, such as pride, honor, etc. (Brewer & Brown, 1998). Consequently, one can speculate if the social desirability bias may be especially relevant in the present context. The results indicate a small tendency towards higher rate of problem identification in other organizations than in the interviewees' own organization. Therefore, the possibility that some of this tendency may be due to the social desirability bias cannot be excluded. However, the researcher's impression

from the interviews was that all informants generally answered comprehensively and also spoke surprisingly freely about the issues of investigation.

The final reliability issue to be considered involves the improvement of the researcher's interview skills through the data gathering process. That is, even though I had some training and experience in interviewing prior to the data gathering, my knowledge about the art of interviewing, as well as technical interviewing skills, improved throughout the data gathering process. These factors, combined with my increasing knowledge of the relevant academic fields and the local conditions in which the EROs operate (e.g., local area, buildings, procedures, informal arrangements, etc.), generally may have improved the quality of the interviews. Based on this observation, it may be imagined that the reliability of interviews also increased throughout the data gathering process. However, it should be emphasized that tendency was minimal and that some of the first interviews were among the most informative. In sum, in conducting the analysis, it was not apparent that the interview quality changes noted affected the reliability of the data.

6.1.2 Validity

On the basis of evaluating the information provided in the interviews as reliable, the following section addresses the validity of the results. Of specific importance in the present context is the identification and classification of the central substance of the responses. In an effort to address these issues, a validity check was carried out by a prominent local emergency preparedness leader in February, 2013. No erroneous information was uncovered. A full validity-check by all involved informants has been considered, and obviously, a full validity-check would have increased the construct validity even more. However, due to the interviewees' tight time schedules (both explicitly and implicitly expressed), the researcher chose not to carry out this procedure.

When presenting the results, the researcher has not put much effort into separating experiences drawn from exercises from those of real life incidents. This, however, should not influence the validity of the results. That is, if a barrier has been manifested in exercises, its relevancy is also assumed for real events. None of the barriers is neither exclusively linked to experiences from exercises.

In the present context, external validity refers to two different elements. First, questions may be raised regarding whether the results are applicable for both the involved counties. The Sør-

and Nord-Trøndelag counties are similar in many ways that are relevant for the present investigation (e.g., demography, topography, organizational structures, etc.), and variations both between and within the counties are sought accounted for in the results (e.g., local variations in demography, topography, etc.). A second aspect to consider regarding external validity is to what extent the results represent the current situation in Sør- and Nord-Trøndelag. The study was conducted in May and June, 2011, and it is probable that there have been some changes since the time of the interviews. After the 22nd July 2011 terrorist attack on Oslo and Utøya, considerable attention has been given to emergency preparedness in the media, in the public debate, and by authorities, and, therefore, it may be imagined that some improvements have been done. Generally, there have been increased exercise activity in Norway since the time of the interviews (NMJPS, 2013), but in relation to Sør- and Nord-Trøndelag it is not known if the increase is thought to be sufficient. Moreover, as no comprehensive studies or evaluations have been published on the issues under scrutiny since the present interviews were conducted, it has proven difficult to review all result details for changes. However, the mentioned validity check of February 2013 did not uncover any outdated information. Moreover, in Sør- and Nord-Trøndelag, the building of the TETRA-net will not be finished before 2015 (NMJPS, 2012b). The ICT barriers related to radio communication are, thus, still believed to be relevant. One concern related to the ICT system seems to be resolved, at least partly; NRCSRC informants worried that the TETRA implementation would make it more difficult to communicate with the EAs. However, lately National authorities have decided delegate the needed economic resources and include selected volunteer organizations in the TETRA (NMJPS, 2013). The situation for the NCD and NHG is still unknown.

6.2 Case Discussion

The present section will address case specific intra- and inter-organizational aspects related to the relevant EROs. The section will begin with a review of some general tendencies, before going into more specific patterns.

6.2.1 General remarks

The manifestation of barriers seems to vary with local conditions. The most central areas of Sør-Trøndelag and Nord-Trøndelag seem to have the best premises for effectiveness in communication and collaboration (e.g., more available personnel, more frequent events providing experience, etc.). These local variations involve a range of factors including

experience, manning, ICT coverage, knowledge about collaborating organizations, negative influence and dominance, etc. Further, there are variations across types of events. For instance, situations that have the potential to escalate are especially challenging. Especially challenging is also tunnel events, due to factors such as lack of skills and linked to radio interoperability and coverage. Moreover, in general, the results indicate that problems are more prone to arise as the scale and magnitude of an event grows; larger and extraordinary events demands use of additional resources (i.e., personnel, expertise, materials, crisis management levels) and even though the introduction of these resources may be planned for and also to some degree trained on (at least in the individual organizations), the ERS functioning in real operations may be inadequate. Additional problems are also introduced if an operation lasts over several days. In long lasting operations the leadership personnel has to plan far ahead in terms of resource use, work shifts etc., and this may affect collaboration through factors such as poor coordination and lacks in planning.

An interesting feature of the present study is that there have been no really large events in the region. Therefore, it is difficult to assess to which degree the ERS in the counties under scrutiny is capable of handling major emergencies and crisis. For instance, the results indicate that long-lasting operations may be problematic. Lacks in regional emergency preparedness have also been highlighted by the 22nd July commission (ORN, 2012) and in Report No. 21 to the Storting (2013). However, it is often not before the catastrophe strikes, problems that become apparent and the public and politicians demand that measures should be taken (Alexander, 2004).[58] The Oslo and Utøya terrorist attacks of the 22nd July, 2011 seem to have had a helpful impact on several such cases in Norway (e.g., the instigation of various preventive measures and clear exercise demands; see e.g., NMJPS, 2013 for a more exhaustive list of preventive and reactive measures).

Another general pattern in the results is the relative dominance of on-scene related issues. Compared to the communication and collaboration between the coordination centers, there are more problems linked to operations and interactions in the field. This is, however, not surprising as all operative physical interactions between the EROs during response occurs here.

[58] In the literature the phenomenon that involves the potential for change following a crisis or disaster have been denoted the "window of opportunity" (Alexander, 2004; Wu & Lindell, 2004).

Lastly, there are also variations regarding the degree of representation of the different EROs in the barriers, and, further, some organizational interactions seem to be more problematic than others. These matters will be addressed in more detail in the following.

6.2.2 Intra-organizational barriers

From the results, it is evident that some organizations are related to more problems than others. The first thing to note is the relative amount of barriers to which the police are connected. That is, contrasted with the other EAs (the FRS and the HS), the results show that the police are much more involved in problematic issues. For instance, the barriers "inadequate establishment of the command post", "inadequate incident command", and "involvement of higher crisis management levels" are almost exclusively linked to the police. Some main problem areas in police work may be singled out: Integration of the crisis management levels with respect to role clarification and decision making under stress, information management throughout events, authority establishment in SAR operations, and the incident commanders' approach to command with emphasis on command post establishment, planning, methodology, and structure.[59] Interestingly, all these factors, to different extents, are linked to how the incident commander exercises his or her role. It thus seems reasonable to argue that the incident commander has a great influence on the quality of communication and collaboration. Moreover, the results show that inadequate incident command is associated with multiple and spreading consequences with regard to communication and collaboration (e.g., undermining trust, negative influence and dominance, organization of the scene, etc.). The incident commander is the highest on-scene authority and functions as the point of communication on-scene for participating organizations and for the police's operations center. Therefore, whoever has the role at any given time has a large responsibility for overall organizational integration and functioning and for assuring that the personnel gets to do their job properly.

The police interviewees seemed to be aware of many of the problems referred to. However, other than these "self-reports" it is interesting to note that while the other EAs (i.e., the FRS and HS) mentioned few issues linked to the police, the police was a primary locus of

[59] Note that some of these aspects may also be valid for other organizations than the police (e.g., those related to decision making under stress), and that it was mentioned in the interviews that there were considerable variation across events.

problematic factors for several of the SRO informants. The SRO informants were also much more preoccupied with problematic factors in the police than the other two EAs. A relevant question then becomes: What can one make of these observations? Generally, one should be very cautious to conclude that the police organization is especially malfunctioning. In contrast to FRS and HS, the police have a more prominent role in emergency response (e.g., cross-sectorial authority, responsible for most notifications, on-scene integration responsibility, etc.). They are the cross-organizational point of integration, and, therefore, interactions with other organizations and organizational levels simply become more widespread and numerous. These conditions may also make such problems more visible and more easily noted by other organizations. Nevertheless, even though these factors may partly explain that the police are especially conspicuous in the results, they do not reduce the relevance or importance of the reported problems related to the police.

Another main tendency shown in the results is the barriers related to the SROs, and especially the NRCSRC. Some may argue that the SROs in general (i.e., the NCD, the NHG and the NRCSRC) stand out by being linked to many barriers, and in many ways that is correct. However, it seems like the voluntary nature of NRCSRC makes the organization especially unstable. This instability means that its available resources vary and that this complicates the EAs ability to accurately assess the NRCSRC exact capabilities. The fact that a considerable part of the NRCSRC operative personnel consists of young individuals varying degrees of experience seems to increase these problems.

Having attended to problems linked to single organizations, the discussion will now take a broader view and focus on inter-organizational communication and collaboration.

6.2.3 Inter-organizational barriers

The results indicate that it may be useful to address communication and collaboration barriers between organizations from two perspectives: Within the EAs, and between the EAs and SROs.

Except the ICT barriers, few barriers are related to the communication and collaboration problems within the EAs. The fact that the EAs have clearly defined roles and tasks, and engage in daily interactions may be contributing elements to the seemingly good collaboration. Another factor may be the existing common meeting grounds (e.g., the Response Personnel Forum, regular meetings between involved personnel, more exercises,

etc.). These matters may also partially explain the observation mentioned over; that the FRS and HS commented on few problems linked to communication and collaboration with the police.

In contrast to the internal EA collaboration, the results indicate that the collaboration between the EAs and the SROs is more problematic (especially the interactions with the police mentioned above). The barriers related to this interaction involve a broad range of factors including knowledge, degree of role and task specificity, turnover, experience, planning, exercises, trust, ICT, procedures, etc. It is especially in non-SAR operations that the SROs presence is linked to several problematic factors. Inexperience may seem to be a keyword. Inexperience here relates to both the SRO units and the responsible EA leaders'. The SRO-personnel is rarely present in such events and often do not have clearly defined tasks and roles. They, therefore, require additional information and clear commands about work tasks. Moreover, the EA leaders are inexperienced with the use of SROs in non-SAR situations; the SROs competence level may not be known for sure and there are simply more actors on-scene to direct and keep track of. These factors may also add another layer of explanation to why informants from the SROs were most preoccupied with inadequacies in the establishment of the command post and incident command. More specifically, they are more dependent on guidance and information, and need a clearly defined location to get these requirements fulfilled. In contrast, the EAs have clearly defined roles and tasks. For them, the way of organizing on-scene is generally well known, and they also seem to handle a relatively flexible on-scene leadership quite well. However, problems in both command post establishment and incident command seem too widespread, and too procedural incorrect to be explained away with inexperienced SRO-personnel.

In sum, the case discussion have argued that the barriers vary with local conditions in the Sør- and Nord-Trøndelag counties, and that operative communication and collaboration seem to be most challenging in field contexts. Furthermore, it has been argued that the police organization and NRCSRC, although in different manners, stand out in relation to the identified barriers. The discussion has also highlighted that the incident commander seems to play a key role for assuring efficient communication and collaboration. Lastly, it has been argued that while the EAs seem to collaborate satisfactory given the existing conditions, the EA – SRO interactions seem to be more problematic.

6.3 General discussion

The general discussion has two main objectives: (1) To increase understanding of the barriers and their interactions by drawing on relevant theory, and (2) build on these ideas, as well as those from the case discussion, to suggest measures for barrier reduction or elimination.

6.3.1 Barrier manifestations and interactions

Reason (1997, 2000) pointed to how latent conditions and active failure can combine with local circumstances to produce an unwanted effect. Reason (2000) states that "high technology systems have many defensive layers: some are engineered (alarms, physical barriers, automatic shutdowns, etc), others rely on people (surgeons, anaesthetists, pilots, control room operators, etc), and yet others depend on procedures and administrative controls. (p. 769). The defensive layers' function is to avoid that the hazards present cause losses.

Here, Reason's Swiss cheese model (1997, 2000) is adjusted to suit the present purposes: To illustrate how communication and collaboration may be limited or hindered by barriers. The starting point is the existing operative personnel that need to communicate and collaborate in order to succeed in solving a given mission, and the goal is effective intra- and inter-organizational communication and collaboration. Moreover, as pointed out in section 1.6.2., here, the barriers do not represent protective measures against something unwanted (i.e., as in Reason's model), but rather barriers for something wanted. Thus, in contrast to Reason (1997, 2000), the aim is barrier reduction, rather than the building of barriers; the holes in the Swiss cheese must be opened or expanded, or the layers (i.e., barriers) must be removed. The adjusted Swiss cheese model is illustrated in figure 6.1.

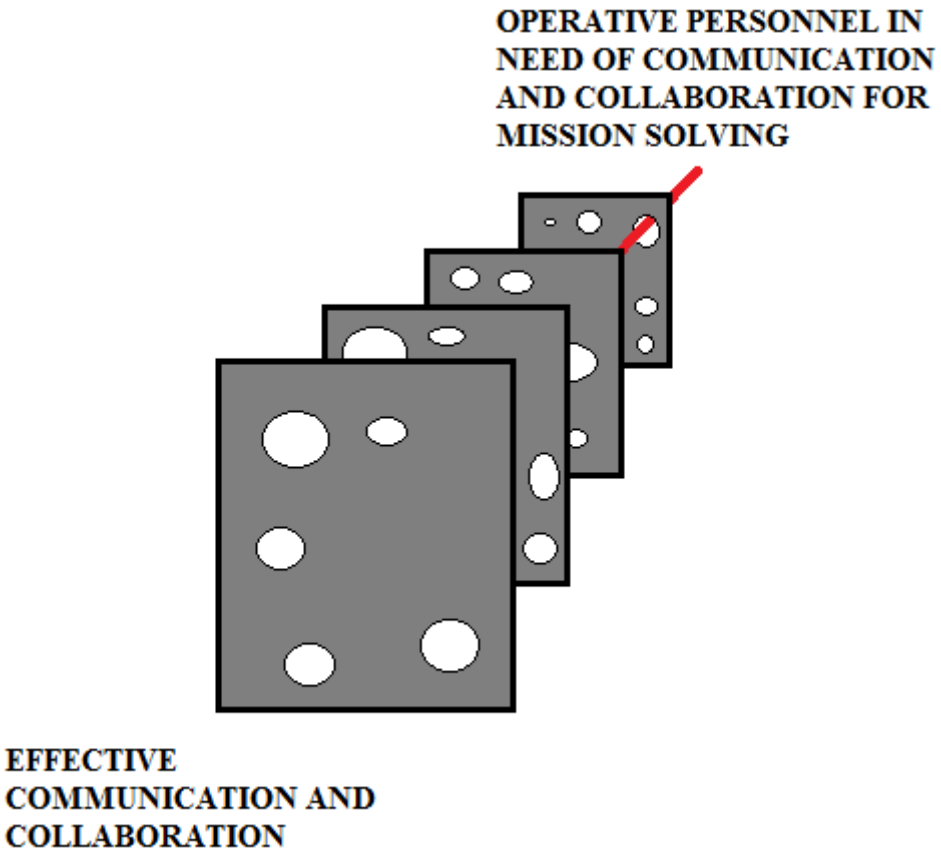

Figure 6.1 Swiss cheese illustration of how effective communication and collaboration can be limited by barriers (adapted from Reason, 1997).

It must be pointed out and emphasized that it is rare that the ability for operative communication or collaborate is totally blocked as illustrated in figure 6.1. Rather communication and collaboration is in most cases only limited by the barriers.

The categories of defensive layers, referred to by Reason (2000) above, correspond to the HTO-perspective. In the present study, three of the barrier categories found in this study falls into a HTO framework (i.e., the individual barriers, the ICT barriers, and the organizational barriers). The exception is the leadership barriers which represent a fusion between the human and organizational dimensions of the HTO-perspective. This exception does not, however, undermine theoretical foundations of the HTO framework, but rather underlines the interactivity of the HTO factors. The factors interact and together they may create layers of barriers against effective communication and collaboration.

When viewed through Reason's terminology (1997, 2000), there seem to be both latent conditions and active failures involved in the manifestations of the identified barriers. Most of the barriers represent what Reason denotes latent conditions (e.g., the ICT barrier category,

the organizational barrier category) while some falls into the category of active failures (e.g., involvement of higher crisis management levels, negative influence and dominance). A third category seems to represent a fusion of Reasons concepts, such as in the barrier of "inadequate establishment of the command post". In this case, latent conditions such as type of training and lacking procedures for command post establishment across different event types seem to interact with active failures such as the on-scene commanders failing to physical gather at the command post – a procedural violation.

In addition to latent conditions and active failures, local circumstances influence the manifestation of barriers. Similarly to Reason's model (1990, 2000), the results show that all the identified barriers are, to a greater or lesser extent, conditionally dependent. That is, circumstantial factors like for instance incident location, event type, complexity, etc., affect barrier manifestation. This means that some barriers are only dependent on the presence of a few circumstantial factors for their manifestation while others manifest only when a rather rare set of conditions is present. The ICT barrier "limited radio interoperability" is an example of the first category. Limited radio interoperability may become a barrier for effective communication whenever there are two or more EROs responding to an emergency that are not in close physical proximity during the initial time of the response; lacking compatibility limits communication opportunities and do so in a stable and systematic way. In contrast, the "involvement of higher crisis management levels" barrier is only relevant in situations where superior management of the response efforts is demanded. Moreover, the barrier need not manifest given these conditions, but according to the informants, the barrier is prone to manifest in districts where higher crisis management seldom is activated in real operations.

6.3.2 The scope and consequence of the barriers

In order to suggest measures for barrier reduction or elimination, two more factors need to be addressed: (1) What is the scope of influence of the barriers? And (2), Which barrier(s) has the most negative impact on communication and collaboration? These questions are to some degree connected to each other. I shall, however, not attempt any precise estimations of the scope and degradation level associated with each barrier. As argued above, the barrier manifestations vary across local circumstances, and the effect on communication and collaboration can also vary due to these changing conditions. However, some general comments can be made.

The first question relates to how a barrier can affect manifestation of other barriers or problems in operative response communication and collaboration. In terms of scope, one barrier especially seems to stand out; the organizational barrier of "lack of training, co-exercise and co-exercise arenas". This latent condition barrier is relevant for a variety of different events and seems to be related to several other barriers (e.g., "inadequate establishment of the command post", "inadequate incident command", "lack of necessary skills", "stress", "negative influence and dominance", "unspecified organizational", "tribal language" and "lack of knowledge about other organizations' capabilities and requirements"). Moreover, as pointed out by, Perry and Lindell (2003) exercises also function as arenas for testing equipment, procedures, routines, etc. Consequently, training and exercises can serve adjust the structural premises for efficient communication and collaboration. Furthermore, the "lack of training, co-exercise, and co-exercise arenas" barrier differs from the other barriers because of its "temporal distance" to the phenomena under scrutiny and, therefore, acts as a background factor that influences actual communication and collaboration efficiency in emergency response. From these observations, it seems reasonable to conclude that training and exercise is a barrier with a wide scope and that is relevant across a variety of different emergency situations.

The second question involves the extent to which communication and collaboration are limited or hindered. Similar to how the concept of risk may be operationalized (Aven, 2007), the extent of limiting communication and collaboration here has to dimensions: Frequency of occurrence and consequence. From the discussion of scope above, it is evident that the barrier "lack of training, co-exercise and co-exercise arenas" has the potential to limit communication and collaboration, although indirectly, in a severe manner. Further, the barrier "limited robustness" may lead to a total breakdown of communication or collaboration and, thus, seems to be a candidate for being the most serious, at least in an acute sense of the word. If the ICT system does not function properly, emergency response becomes very challenging (Woltjer, Lindgren, & Smith, 2006). However, even though a total breakdown of the ICT system may have large consequences, it does not occur very often. Other barriers that do not have as serious consequences for communication and collaboration, but that manifest more frequent, are, therefore, also important to consider when discussing which barriers that are most serious for the phenomena in question. This aspect is related to the barrier manifestation discussion above and which highlighted "limited radio interoperability" as a barrier that depends only on few local circumstances for its manifestation. Further, adequate leadership in

emergency situations has also been underlined crucial for collaboration (Crichton & Flin, 2001; Flin, 1996). One can, therefore, assume that the leadership barriers are may severely limit communication and collaboration. From the results, the leadership barriers "inadequate establishment of the command post" and "inadequate incident command" seem to manifest quite often, and should, therefore, be regarded as barriers that potentially degrades efficiency in communication and collaboration severely.

Other barriers may also hinder collaboration through the exclusion of relevant organizations in operations. This includes the barriers "lack of knowledge about other organizations' capabilities and tasks" and "inadequate notification procedures". These barriers are especially linked to the inclusion of SROs, and may hinder collaborative initiatives from the relevant EAs in situations where such initiative could have been appropriate.

Before moving on to measures for barrier reduction and elimination, a research question that needs to be addressed in more detail is: *How can vertical and horizontal extensions of organizational structure affect the quality of communication and collaboration in an operative context?* The next section will address this question.

6.3.3 The impact of organizational extensions

The results illustrate that organizational extensions are linked to several barriers for communication and collaboration. The discussion will now make a more theoretical approach to these matters while aiming to understand the underlying factors that contribute to issues at hand. Challenges related to organizational extension will be attended to on three levels: *horizontal inter-organization collaboration*, *vertical intra-organizational collaboration*, and *collaboration in the on-scene leadership team.*

6.3.3.1 Horizontal inter-organizational collaboration

The case discussion argued that there were more problems that were linked to EA – SRO relations than between the EAs. When discussing how horizontal organizational extensions affect the quality of operative communication and collaboration, it is, therefore, necessary to separate between when the organizational extension involves more EA units than normal, and when SROs are included. Further, in order to enable the later discussion of how the barriers may be reduced or eliminated, it is important to understand more about why different types of horizontal organizational extension affect the processes of interest differently. The following discussion will argue that explanations may be found in pre-existing structures.

Pre-existing structures (i.e., structures established prior to the actual response) are essential for efficiency in emergency response (Dynes & Quarantelli, 1977; Kapucu, 2006). In section 2.2.4, Dynes and Quarantelli (1977) underlined one such structure; the importance of that adequate links between organizations is established prior to response situations. In an operative context, there are deficiencies when it comes to organizational integration. A striking example of such deficiencies is the current ICT radio system. In a field context, the opportunities for inter-organizational communication are very limited and inefficient. That limited ICT interoperability may severely hamper collaboration have also been noted by other researchers (Comfort, 2006, Jungert, Hallberg, & Hunstad, 2006; Bharosa, Lee, & Janssen, 2009; Kapucu, 2006). However, the results show that the manifestation of the interoperability barrier varies. For instance, according to informants, there seem to be sufficient levels of interoperability between the coordination centers of the EAs. Drawing on Dynes and Quarantelli (1977) concepts in an ICT context, one can thus say that pre-established ICT links exist, but currently they are too few, inflexible, and inefficient. Because of the upcoming nation-wide improvement in the area of ICT, the discussion will not elaborate in detail on these matters.

ICT interoperability between organizations is a straightforward and concrete example of cross-organizational links. However, Kapucu (2006) has underlined the importance of non-technical matters. Knowledge is one such link. More specifically, in order to assure optimal use of resource and efficiently coordination in emergency response, the responsible personnel must be aware of the available resources. Oomes' (2004) concept of organizational awareness seems to be relevant in this context. The results indicate that there is lacking knowledge about other organizations capabilities and resources. Especially, this involves the EAs knowledge about the SROs. Using Oomes' (2004) terminology, these results indicate an insufficient organizational awareness among central EROs. As mentioned, such lacks may limit optimal utilization of existing resources; SROs that have the competence and material resources suitable for a specific operation may be excluded due to lack of knowledge in the EAs. The results seem to indicate that this is sometimes the case. Other official Norwegian studies confirm this; lacking knowledge about available resources was also highlighted by the 22nd July Commission (ONR, 2012), and in Report No. 21 to the Storting (NMJPS, 2013) the Norwegian Government states that it will evaluate further if a national registry of response resources shall be establish. Such a registry would provide relevant actors with updated information of response resources locally, regionally and nationally (NMJPS, 2013).

According to NMJPS (2013), a registry may provide better links between organizations and make notification easier. Oomes (2004) suggests a computer-software, *organigram*, for use in response situations. An organigram may contain both a registry of the existing resources, and a dynamic overview of the availability on-scene. In order to have an updated overview of available personnel on-scene, people should be registered in the system as they join the rescue efforts (Oomes, 2004). However, if an organigram should be developed and implemented in order to increase organizational awareness, it must be designed based on knowledge of the limits of human cognition. Research on the benefits of using similar displays is mixed and especially during periods of high workload the use of displays may be problematic (Bolstad & Endsley, 2000). Nevertheless, having a continuously updated overview of available organizational resources must mainly be regarded as an improvement of the current situation.

In some cases, it may be that organizational awareness is not enough for assuring better utilization of existing resources. In order to take better advantage of response resources, organizational awareness should be accompanied with organizational trust (Kapucu, 2006). That is, an awareness or knowledge of existing personnel resources does not mean that whoever needs assistance can be certain about the actual competence level. Consequently, trust is undermined (Salas, Sims, & Burke, 2005). According to Kapucu (2006), pre-existing trusting relationships serve link organizations together and facilitate response collaboration. However, the present results indicate that organizational trust is not easy to establish and maintain. This problem mainly involves the problematic EA – SRO relations mentioned in section 6.2.3. Some main obstacles seem to be related to the fact that the EAs and SROs collaborate less in real operations, and co-exercises are scarce. They do neither share a social identity, and in the SROs, the competence levels fluctuate and will most like continue to do so, especially in the case of the volunteer organizations. Hence, there may always be some uncertainty in relation to other organizations' personnel competence, and this potential gap between "planned competence" and "real competence" may be hard to bridge. However, Kapucu, Arslan, and Demiroz (2010) point out that interdependency among organizations can increase the likelihood of success collaboration even when trust is lacking. In a Norwegian emergency response context, this is promising. Norwegian geographic, demographic and economic constraints mean that successful collaboration among the wide variety of NSARS actors is a necessity for the ERS to be well-functioning. The involved organizations need each other to assure sufficient emergency preparedness

and management (NMJP, 2003). Interdependence when trust is lacking, therefore, is valuable.

Physical response phase collaboration between EROs happens mostly on scene. Berlin and Carlström (2011) distinguished between three types of collaboration: Sequential, parallel and synchronous. Based on Berlin and Carlström's distinctions, some inferences may cautiously be drawn about on-scene inter-organizational collaboration in Sør- and Nord-Trøndelag. On-scene, it may seem that sequential and parallel collaboration is the norm. In the interviews, informants explicitly spoke of the importance of clearly defined roles and tasks, and that the personnel, including leaders, had a tendency to stick to their own organization. It may, thus, seem like boundary spanning activities often do not to function properly in an operative on-scene context.

Utterances were also made about the idea of providing assistance across organizational boundaries. For instance, when addressing inter-organizational collaboration, FRS interviewees expressed dissatisfaction about having to execute tasks that were formally defined as police's area of responsibility. The police were not present on-scene at all in the mentioned case, and one should be cautious to generalize from a few statements. Nevertheless, the displeasure might say something about the attitudes against synchronous collaboration. Berlin and Carlström (2011) make a value differentiation between the three types of collaboration, where synchronous collaboration is the excellent form and sequential the most primitive. The case of the FRS officer illustrates that striving for such excellence in an emergency response context may not be a priority. Berlin and Carlstöm's (2011) empirical results indicate that this also is the case in on-scene contexts in Sweden. However, in an on-scene multi-organizational context, one can ask if a value judgment on different modes of collaboration is appropriate. That is, rather than continuously seeking what Berlin and Carlström (2011) describe as the excellent collaboration type, the organizations should rather strive to adapt the type of collaboration to the situation. That is, different situations may require different approaches to collaboration, and it seems reasonable to assume that too many improvisation initiatives may decrease control and degrade collaboration effectiveness. Nevertheless, Berlin and Carlström (2011) seem to have a good point in that the personnel should look for opportunities to assist independently of organizational belonging.

6.3.3.2 Collaboration in the on-scene leadership team

The on-scene leadership team leads all field operations and is a major point of interaction between the EROs (NNPD, 2011), However, as mentioned, several of the identified barriers are related to the on-scene leadership team.

Two central barriers are "inadequate establishment of the command post" and "inadequate incident command". An intriguing question becomes: Why is there on-scene leadership team so prominent when it comes to communication and collaboration barriers? Some of the explanation probably overlaps with those that partly explained why the police are "overrepresented" in the barriers (e.g., visibility, number of interactions, etc.). In addition, as pointed out by informants, years of practical training (i.e. "being too operative") may also be a factor that influences the functioning of the on-scene leadership team. Nevertheless, although these factors may be influential, team related factors probably also matter.

A striking feature of the on-scene leadership teams is that they are usually constituted ad-hoc. In section 2.3.6, Schraagen and van de Ven (2011) argued that temporary teams are especially prone to experience problems. Salas, Sims and Burke's (2005) theoretical construct the "Big Five" of teamwork effectiveness posits that the effectiveness in teamwork is determined by the interplay between five main factors, and three underlying supporting conditions. More specifically, Salas, Sims, and Burke (2005) pointed to how the coordinating conditions (shared mental models, mutual trust, and closed-loop communication) are prerequisites for the "Big Five" of teamwork effectiveness (team leadership, mutual performance monitoring, backup behavior, adaptability and team orientation). Empirical studies have shown that ad-hoc teams are related to factors such as lack of shared mental models and mutual trust (Schraagen & van de Ven, 2011) and, according to Sims, Salas, and Burke (2005), the result is poorer team effectiveness. In the present context, it is also likely that difficulties related to command post establishment sometimes may add to the existing teamwork problems; when there are lacks in the organizing on-scene structures, it may be even more challenging to establish well-functioning ad-hoc teams. Furthermore, inadequate command post establishment may produce a need for engaging in distributed work, meaning increasing dependence on the ICT systems associated with the identified five ICT barriers. In such cases, communication and collaboration (perhaps especially in terms of coordination measures) may suffer as development of a shared situation awareness is hampered (Endsley & Jones, 2001). The leaders cannot look at the same maps or displays, or hear the incoming message (i.e., because of lacking interoperability). This example of an event chain illustrates how

systematically occurring negative events can influence each other severely degrading efficiency.

The team leader is a prominent team member. In an on-scene context, the team leader equates the incident commander. From the results, it is evident that the way leadership is exercised varies across incident commanders. The degree of a structured methodology and practices for including SROs leaders were key areas that were mentioned. Some informants expressed that their needs linked to active participation in decision making, and maybe especially information, were sometimes not met. For instance, the NRCSRC informants mentioned that lack of updates about risks in operations and the NHG highlighted lacks linked to situational updates in SAR missions. Information, in this context, is, closely linked to decision making. That is, in order to make informed choices about the operations, an overview over, or situation awareness of, central developments is important (Bram & Vestergren, 2011). However, the results seem to indicate that there exist different opinions or mental models both about participation in the decision making process and the necessity or value of developing of a shared situation awareness in the on-scene leadership team. Pigeau and McCann's (2000) concepts of implicit and explicit intent can possibly inform the understanding of these diverging views. In an on-scene leadership team, effective sharing of explicit intents can be done through Wilson and colleague's (2007) communication types: Information exchange, phraseology and closed-loop communication, and by applying Grice's Cooperative Principle (1975). In the present context, some problems seem to relate to these modes of information sharing. The ones mentioned above (i.e., lacks in information distribution) indicate that the information exchange in the on-scene leadership team is sometimes inadequate; the information is not distributed proactively and the situational updates are not prioritized sufficiently. However, it is possible that these problems also are linked to implicit intents, and maybe especially those intents Pigeau and McCann's (2000) denote operative expectations. Operative expectations are based on training, procedures, traditions and values of the unit and, obviously, these vary between organizations. In some situations, expectations may be conflicting, and in the next step, lead to difficulties in collaboration. An example may be when the SROs expect to be included in the command post while the incident commander does not allow this. This divergence may also be linked to personal expectations (i.e., expectations based on style and own experiences; Pigeau & McCann, 2000). That is, considering the variability in which the incident commanders execute their role it might be that the personal expectations are allowed to be too flexible and that more strict procedures

are needed. However, in the case of command post inclusion/exclusion there does not seem to be strict guidelines. Rather, the norm seems to be that the incident commander decides who should be included. Flin (1996) approach a similar problem by advocating a flexible leadership solution. She argues that the way on-scene operations are led should be adjusted according to situational constraints. According to Flin (1996) a consultative type of leadership should be sought whenever there is time. However, when time is sparse the incident commander should be able to exercise a more directive form of leadership (i.e., as opposite to consultative) (Flin, 1996). However, for a flexible approach function optimally, the approach and guidelines should be known among the involved leaders. The results indicate that the varying modes in which leadership is exercised may be more a product of personal preferences than strategies for efficient adaption across situations.

6.3.3.3 Vertical intra-organizational collaboration

The results show that communication and collaboration barriers may arise in the interaction between the operational and tactical levels of crisis management. Considering that the personnel in these positions usually have extensive work experience and training, this finding was surprising. On the other hand, major events that demand the activation of the higher crisis management levels are rare in the area, and consequently, the crisis management staff is inexperienced in managing real events. According to the results, processes like information flow and decision making do easily suffer when higher crisis management levels are introduced. Moreover, areas of responsibility may get unclear, and experienced officers may become insecure regarding exercising authority. Interestingly, these phenomena arise despite that roles, authority and responsibilities are clearly defined in procedures and well known to the involved personnel. Informants explained this as a result of stress, and according to Brun and Kobbeltveit (2006), stress related factors may indeed explain these effects. For instance, Brun and Kobbeltveit (2006) highlighted how stress can create tunnel vision while Weick (1996) pointed out that stress can cause people to regress to over-learned behavior. In addition, the police are a strictly hierarchical organization and in such contexts research have shown that aspects linked to social status can interfere with the communication and collaboration processes (Cosby & Croskerry, 2004). These and similar factors may clearly degrade performance and contribute to active failures.

Even though stress partly may explain the collaboration problems between crisis management levels, it is also possible that there exist diverging mental models on crisis management

integration among the personnel. According to NNDP (2007) the tasks and responsibilities between these levels can be somewhat overlapping, meaning that tactical personnel sometimes may engage in strategic work and vice versa. From the results, it is clear that it is argued for a strict segregation between tasks and responsibilities. Flin (1996) also states that it is possible that the leadership personnel at the different levels (i.e., strategic, operational, tactical) should possess different personality characteristics. If this is the case, it will be an argument for strict segregation of tasks and responsibilities.

Summing up, it has been argued horizontal and vertical organizational extensions of the emergency response apparatus are associated with multiple challenges on several levels. Generally, these problems fall into two categories: (1) Those that are present in most operations, but grow quantitatively or qualitatively as the organizations expands (e.g., differing expectations, attitudes, practices, etc., and (2) those that appear as a consequence of organizational extensions (e.g., problems associated with the higher crisis management levels).

6.3.4 Implications and barrier management

A research question that remains to be discussed is whether the identified barriers in any way can be effectively managed. From the results, it is evident that several if not to say the vast majority of the barriers, at least in principle, can be reduced or eliminated by taking various preparatory measures. "In principle" here means without evaluating political priorities and economical expense, including cost and benefits.[60]. Here, it will be argued that the barriers may be effectively reduced by focusing on four key measures:

- Implementation of a more robust ICT-system.
- More training and co-exercises.
- Improving leadership processes and structure.
- A heightened focus on the use and inclusion of the SROs.

These four areas will now be addressed in order.

It has been shown that the current ICT system represents major barriers for communication, and may do so in a wide variety of emergency situations. When viewed through the lenses of the SWTMC (Shannon & Weaver, 1949), communication barriers can be found in several of

[60] These two factors are outside the present thesis' scope.

the model's components or in their linkages (e.g., the barrier of "limited radio interoperability" equals incompatibility between the *transmitter* and the *receiver*, "limited mobile and radio coverage" involves that the signal sent from a *transmitter* does not reach the *receiver*, "low speech quality" means that the channel is disturbed by noise, etc.). These results are similar to those of an earlier study by the NDEC (2007). An upgrading of the ICT system will represent a major barrier reducing measure. Evaluation studies from areas where the TETRA already is in use show that all the five ICT barriers ("limited robustness", "limited mobile and radio coverage", "limited radio interoperability", "limited net capacity" and "low speech quality") are reduced through the implementation of the TETRA-net (The Norwegian Agency for Public Management and eGovernment, 2011). Moreover, when key volunteer organizations also will be included, the radio interoperability barrier will be further reduced. Therefore, when the TETRA will be implemented in Nord- and Sør-Trøndelag in 2015, five of the eighteen identified barriers are expected to be significantly reduced. However, it is important that the new opportunities provided by the TETRA-net do not decrease the willingness to engage in collocated work among on-scene commanders. The EROs must be aware of this possible incentive towards distributed work inherent in the new system.

In addition to the TETRA-net, operative emergency response collaboration could also benefit from other ICT solutions similar to the organigram. Through such a registry, available resources can become more visible and known, and resource use and coordination may be optimized (Oomes, 2004).

The second area that is suggested to be effective in reducing barriers is training and co-excises. This is because lack of training and co-exercises, as argued earlier, seem to be an underlying factor that contributes to the manifestation of several other barriers; the barriers' scope is wide. Perry and Lindell (2003) pointed to how exercises allow the testing of the ERS and its components, as well as bringing organizations into contact with one another. Through such initiatives, the personnel may develop relationships which may facilitate trust and build an informal network of boundary spanners that may facilitate communication and collaboration during emergencies (Uhr, Johansson, & Fredholm, 2008). Woltjer, Lindgren, and Smith (2006) state that full-scale exercises are especially important for such positive developments. Moreover, exercises also allow personnel and teams to develop shared mental models (Mathieu et al., 2000). In Kapucu's (2006) terminology, co-exercise, serves to build or strengthen the links between organizations. These measures correspond with the recent Report No. 21 to the Storting (2012-2013) (NMJPS, 2013). The NMJPS states that collaboration is an

area of improvement in Norway and that more exercise and training is needed in order to improve collaboration between the EAs, the police and military in armed missions, and more joint planning and training between police districts. The results and suggested improvement measures of the present study points in the same direction. However, in addition to the areas of training and exercise highlighted by the NMJPS (2013), the present study also underlines the need to establish designated arenas for multi-organizational exercises and the importance of including the SROs in the co-exercises. More and targeted training and co-exercise should in general also serve to decrease the stress levels among the personnel both in the EAs and SROs.

The third main area of improvement involves leadership. In section 2.2.4, Laberg, Eid and Johnsen (2006) stated that leadership involved process and structure and this study indicates that barriers may be reduced by measures aimed at improving both. It has earlier been argued that some barriers manifest due to the way leadership is conducted. This suggests that operative communication and collaboration can be improved by targeted training and education of leaders. The training and education should aim at vertical collaboration processes within the organizations (i.e., between crisis management levels) and horizontal collaboration within the on-scene leadership team. The training and education should be aimed at individuals with key roles in operative emergency response. Internally in the EROs, and according to this study, especially in the police, more efforts should be made in assuring that inter-level collaboration functions properly. If the crisis management levels together cannot make and implement decisions in a timely and efficient manner, the consequence may, for instance, be that the situation escalates and lives might get lost. The operational staff in all police districts in Norway will, in the course of 2013, will have gone through a staff work training program (NMJPS, 2013). The results show that staff training could benefit from involving the commanders on the tactical level (i.e., in a police context, the incident commander). Furthermore, it is evident that the incident commanders may play a central part in determining the quality of operative communication and collaboration processes. In Report No. 21 to the Storting (NMJPS, 2013), it is pointed to lack of competence and training among police leaders, including the incident commander and operations leader. Only a minority of the persons that currently occupies these positions have undergone relevant further education (NMJPS, 2013). This seems to verify the problems related to these positions that were reported by the informants, and may partly explain the reported variation in the ways incident command is exercised (i.e., the possible difference between personal and operative

expectations). Similar to the present study, the NMPJS (2013) also points to a need for increased demands for training and competence development for incident commanders, but does not specify what should be the focus of training. This indicates that a part of this training must focus on the practical leadership of multi-disciplinary teams and that such training would benefit from including on-scene leaders from key organizations. Inter-organizational tactical leadership training would possibly serve to improve several factors, the most critical being the low-level boundary spanning activities, and better clarification of roles and tasks.

Operative communication and collaboration in the ERO leadership might also benefit from structural interventions. For instance, the results of the present study indicate that there is a need for a more methodological and standardized approach (including better planning methods, more efficient meeting structures, and better utilization of available expertise on-scene), assuring an updating of situation awareness among collaborating commanders within their responsibility area, better clarifications of tasks, roles and responsibilities, and measures to reduce the probability for underestimating of an event's escalation potential (e.g., guidelines for proactive ordering of resources whenever the situation is deemed uncertain, and there is doubt about the escalation potential). Structural leadership measures might also be sought through the Unified Leadership System, which was implemented by the FRS and NCD in 2011. This is a system that builds on the principles from the American Incident Command System and has been adapted to a Norwegian context. It involves a flexible organizational structure which can be adapted and adjusted according to situational demands (NDCPEP, 2011b). A way forward for operative emergency management in Norway may be that the other relevant EROs implement the Unified Leadership System. In the U.S., this system is currently implemented across several EROs, and there are possibly lessons to be learned from this more holistic approach to emergency management leadership structure.[61] With a standardized system for emergency management roles, responsibilities and organization can potentially be clearer and more known throughout organizations; the model of command and control becomes common for the involved organizations and, in the words of Pigeau and McCann (2000), the sharing of intent becomes easier to achieve.

The SROs have had a main focus in the thesis, and the last main area of improvement measures involves these organizations. The results indicate that the SROs need more explicit consideration when it comes to collaboration and multi-organizational integration. Given the

[61] http://www.fema.gov/incident-command-system

conditions in Norway (e.g., demography, topography, etc.), the SROs are an indispensable and flexible resource, and, therefore, should be focused on when it comes to communication collaboration; maybe especially in an on-scene leadership perspective. In April, 2013, an official commission delivered an evaluation study of how to make better use of the NCD and NHG (ONR, 2013). Similarly to the present study, the evaluations also point to matters such as the need for role clarifications and more co-exercises. The evaluations do not, however, consider the problems linked on-scene inclusion and low-level boundary spanning (i.e., lacks in communication between on-scene leaders) found here. Currently, the SROs, in many ways, represent challenges in all four barrier categories (i.e., organizational, ICT, leadership and individual). Some of these challenges seem to be difficult to mitigate. This does mainly involve the "organizational instability-" and "unspecific organizational tasks" barrier. The personnel in the NHG and the NCD are recruited for limited periods of time, and in the NRCSRC, the personnel participate on a volunteer basis. This means that these organizations will always be more instable than the EAs, and, therefore, one can only aim at providing the best training possible given the existing conditions. As for the "unspecific organizational task" barrier, this is a type of role and task flexibility that should allow targeted use of resources in large scale emergencies. Given the availability of resources (especially in less central areas), this type of organizing seem reasonable. Therefore, one must assure that the flexibility does not create uncertainty, but is sought handled by the responsible on-scene commanders in the EAs. More training and co-exercise combined with more standardized approaches and targeted training of key leadership personnel might mitigate some of these problems and reduce the uncertainty that may arise through the introduction of SROs. However, a premise for such positive developments is that these barriers are known and focused upon. In addition to these measures, awareness of phraseology problems (i.e., here the "tribal language" barrier) must be heightened, especially in linked to communication in critical situations. Lastly, and more easily achievable, better integration of the SROs can possibly be improved by implementing clearer procedures for notification (i.e., timely warning, forewarning and clarifications linked of use of the NHG).

In sum, together these four measures should serve to reduce-, and in some cases even eliminate the barriers.

7. CONCLUSION

The primary aim of the present qualitative case-study was to identify and describe barriers that may limit or hinder operative communication and collaboration within and between key EROs in the Sør- and Nord-Trøndelag counties, Norway. These issues were investigated through the use of semi-structured interviews with mid-level leaders in six selected EROs. Furthermore, the purpose was to identify the weak points in the ERS so that measures for improvement could be taken. The thesis has identified eighteen barriers, which can be separated in four barrier categories. The categories of barriers are linked to organizational, technological, leadership, and individual domains. The eighteen barriers affect communication and collaboration in different ways. Moreover, there is considerable variation in terms of negative consequences depending on which barrier that is manifested, and some barriers manifest more frequent than others. Furthermore, the barriers may interact, and some barriers seem to be involved in the manifestation of other barriers. The barriers also seem to vary with local conditions. Lastly, the thesis shows that some EROs are more linked to the barriers than others.

The study has had a focus on the negative consequences of extensions in organizational structure in emergency response situations. The results indicate that such extensions can be problematic in both a vertical and horizontal sense. Vertically, the problematic factors found were linked to integration of the police's higher crisis management levels (strategic and operational) with the daily line management. Horizontally, the thesis have identified that the links (ICT, relations, boundary spanning activities, trust, etc.) between organizations are inadequate. Further, the thesis has argued that both horizontally and vertically the barriers are primarily linked to four key factors: Leadership process and function with emphasis on the on-scene leadership team (especially the incident commander), the ICT system, training and co-exercise, and the use and inclusions of the SROs.

The thesis suggests that improvement and barrier reducing measures are in principle possible for most barriers. Furthermore, such measures may in many cases not be very complex. The thesis has argued that barrier reduction can be achieved by focusing on four key areas:

- Implementation of a more robust ICT-system.
- More training and co-exercises.
- Improving leadership processes and structure.
- A heightened focus on the use and inclusion of the SROs.

These four factors either has a wide scope- (i.e. by affecting the manifestation of other barriers), are prone to have a serious impact on the quality of communication and collaboration-, contributes to the exclusion SROs-, or degrade system performance when the SROs are involved in operations. Thus, by focusing on these areas, the identified barriers are believed to be greatly reduced or even eliminated. It is, however, crucial that the interventions also are based on risk assessments and draw on the knowledge from the existing emergency, crisis and disaster literature.

7.1 Implications

The present thesis has had a broad and explorative perspective on barriers for communication and collaboration in emergency response. Factors that may negatively influence communication and collaboration in emergency response context have been identified and described. The degree of detail is, however, limited. Future studies must seek a deeper understanding of the barriers. An area that should be investigated in-depth is the relative influence of the barriers on the phenomena of interest. The results indicate some barriers have stronger effect on the communication and collaboration than others. A quantitative study might yield insights into these matters. This does also apply the interrelations between the barriers.

Further, the study has shown that there are several problems associated with the operative leadership of emergencies. From a psychological perspective it would have been interesting to explore the problems in more depth. Examples of research areas could be: The role of prior practical experiences in affecting leadership personnel behavior in emergency situations, how motivation may influence inter-organizational collaborative behavior, prejudice and social identity in EROs, how uncertainty in terms of lacking knowledge of actual competence in the EROs may shape organizational behavior in emergency response, and the relation the between leadership structure- and process for successful teamwork in emergency response.

Any ERS is a dynamic system that interacts with an often challenging environment according to demands for immediate action, and consequently, these fluctuations will always produce some losses over time in the sense that a given event could have been handled better than it were. Therefore, improvement of the ERS is a continuous process that must go on throughout all phases of emergency management. This thesis set out with more of a practical-, than theoretical aim. Hopefully it has provided insights that may aid the process of designing a more robust and well-functioning ERS.

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Notes

[i] *De sier jo selv at de kan ha problemer med å skaffe folk i sommerferien, litt mer enn vi har da.*

[ii] *Ellers er jo selvsagt noe av utfordringen være dekningsgraden på samband og slike ting.*

[iii] *Men nå, når det har kommet inn et stabs-apparat over, så sender en det dit og så får du ikke noe svar tilbake (…) Og så henger ting litt i løse luften.*

[iv] *Inntil de da får opplevelsen der ting blir for overveldende (…) Og så tilter du. Og så blir du helt passiv.*

[v] *Det som er da vet du er at mange av disse etatene har jo gode kurs.. politiet kjører jo mye av sine operative kurs i Stavern på justissektorens kurs og øvingssenter JKØ… og så har brannvesenet sin brannskole i Kjellsund i Nordland, på grensen til Troms. Og så har jo helsevesenet sine egne fragmenterte utdanninger, men det er ikke så mange arenaer som er laget for sånne samhandlingsøvelser og det er jo det vi snakker om her.*

[vi] *I og med at vi ikke trener så mye som vi gjorde før så tar det litt lengre tid før vi er klar enn det vi gjorde før. For at, når vi har avdelinger som ikke har trent sammen på tre-fire år, så er det ikke bare å kalle de ut og sette de i oppdrag. De må faktisk ha lengre tid på å bli klar og trent seg opp og bli kjent før de kan settes inn.*

[vii] *Så det er en del info der som må tas tak i når vi kommer fram da (…) Så vi må vite hva vi skal gjøre, fluktvei, diverse ting. Og det kan være en utfordring når ting virkelig er hektisk da. At de rett og slett forstår at vi ikke har behov for det, og da må trekke oss tilbake. (…) Nå tenker jeg samvirke øvelser og erfaringer derfra (…) Det er liksom mangel på informasjon som er på en min egen opplevelse av at ting har vært rett og slett da, det har vært brannfare eller andre ting (…) Altså, rett informasjon i fra noen som har ansvaret for den sektoren de er i som kan ta en vurdering og faktisk ha en brief med at området her, hvis sånn og sånn skjer så trekk dit.*

[viii] *Det som er litt av problemet da er at nødetatene, de profesjonelle, det er jo faste stabile organisasjoner, mens frivillig organisasjoner, de kommer jo og går, ikke sant. Altså, for eksempel i Røde Kors så "så kan det jo være interessant å være i Røde Kors, men i høst så slutter jeg", ikke sant. Så kommer det kanskje noen nye, eller at det ikke blir noen i det hele tatt (…) Du får stadig nye personer i organisasjonen eller at den skrumpe.*

[ix] *Så vi vet jo hva de står for, gjør vi i navnet. Men vi vet ikke hva de står for i gavnet, når du får de der [på skadestedet]. Altså klarer de å levere det de sier. For altså de består jo også av individer, som blir påvirka av inntrykkene de får. Og når de kanskje sjelden eller aldri har vært i sånne situasjoner, vil de da klare å leve opp til det de har sagt de skal levere?*

[x] *Det vi ser da vet du, det er at røde kors, det er jo frivillig (…) Og du ser at de kommer som det passer seg for å si det sånn. Så du vet aldri hva de får til av ressurser. Noen ganger så kommer de med veldig få og noen ganger så kommer de med veldig mange.*

[xi] *Når du snakker om frivillige organisasjoner i ulykkessammenhenger, og i, det samme med Sivilforsvaret. Altså, de har ikke spesifikke oppgaver, de må settes til oppgaver for å støtte for eksempel helsevesenet med å bære pasienter. Eller støtte brannvesenet med å få frem utstyr, lys, vann, ikke sant (…) Sånn at det blir en utfordring å en måte å lede de. Og den utfordringen har vi ikke ellers, for da snakker man bare sammen og så går ting av seg selv.*

[xii] *Men utfordringen er jo for FORF da, er jo at når ting virkelig brenner nede på politi, og det er en hendelse utenom det vanlige. Så kan det ta tid før de finner ut at de trenger flere ressurser.*

[xiii] *Hvis en tenker på heimevernet og utnyttelse av det (...) Så er det varsel. Å få tidlig nok varsel til å kunne reagere, til faktisk å kunne yte en eller annen form for støtte.*

[xiv] *Altså, de trenger ikke å si "Kom nå". For det er det som skjer da. "kan dere komme nå", og helst skulle ha vært der for en time siden. Men bare informere om at de har en sak og sånt.*

[xv] *Der vi bevæpner oss og løser oppgaver. Da er en veldig sånn forsiktig på hva man sier. Hva man legger i ordene. Så vi er blitt veldig bevisste på selv de siste årene på hva legger vi i ordene (...) Vi har jo sånn "pågripelse", "bekjempelse", "innbringelse", hva legger du i de begrepene (...) ja, hvis politiet sier "bekjemp" eller "nøytraliser". Hva legger du i nøytralisere sant (...) For det er litt kommandospråk, sant. Og det skal det være litt snert i noen ganger, for det ska være så presist, for det skal ikke være noe rom for tvil. Og da har du noen sånn kulturer rundt hva du legger i det enkelte ord og uttrykk, så du skal være litt forsiktig (...) Det har jeg opplevd i hvert fall, men det har blitt mye bedre i dag.*

[xvi] *Vi ser det internt i grønt [militæret] også. Altså, hvis vi samarbeider med sjøenheter, så har de en annen måte og kommunisere på radio f. eks enn hva vi har. Men vi får hverandre forstått.*

[xvii] *Vi har så mye dritt som egentlig er laga for å fungere under helt sånn normale forhold. Og når vi da får regn, storm, ras og nedfall av mobilnett så begynner det å dra seg til. Det skal ikke så mye til vet du.*

[xviii] *Det er noen områder med dårlig sambandsdekning. Det er klart er en stor utfordring. (...)Og det tror jeg alle opplever at de har områder i sine distrikt som det ikke er noen dekning på. På helseradioen ja. Og kanskje ikke på mobil (...) Da har du ikke noe. Da må du organisere deg selv bare.*

[xix] *I tillegg så er det en utfordring det her med redningskanal 1. Også på bakgrunn av at det er en én-frekvent kanal, det vil si at den går bare mellom radioene da. Den går ikke via noen radiomast.*

[xx] *Ja, altså, nødnettet, når det kommer, så har du midler [til å kommunisere] (...) Og da kan du ikke skylde på at. "jeg fikk ikke til å gi deg den beskjeden jeg" "jeg fikk ikke tak i dag på radioen." Da kan du ikke. "Det er for seint å ta kontakt med min sentral, og så skal han ta kontakt med din sentral og så skal det videre ut til deg". Da er det for seint. "Så jeg vurderte det sånn." Så derfor så visste ikke helse det at. Det her var en gasslekkasje. Og de kjørte rett inni gass-skyen for eksempel som er et sånt skremmende scenario da. Og det var viktig informasjon som brann satt med, som MÅ formidles. Og hvis det ikke er kommunikasjon i mellom så får du ikke formidlet.*

[xxi] *En veldig stor mulig utfordring i forhold til samhandling, det er hvis det nå blir sånn at FORF ikke er på TETRA eller får dekket TETRA. For det vil jo være en ganske enorm kostnad. Der all kommunikasjon går på TETRA og ingen av de frivillige er med. Det er en bekymring som har blir lansert fra Norges Røde Kors i hvert fall, når det gjelder hjelpekorps. Da betyr det at vi må bruke telefon inn til AMK. Og, de må ringe oss. Og, er det ikke dekning akkurat på det punktet du er da, så er vanskelig å få tak i oss da. Kjører scooter og ikke hører mobiltelefonen. Nå har vi jo fortsatt sambandet vårt, men det hjelper jo lite å samhandle med andre når en ikke får tak i de.*

[xxii] *For mange på nettet ikke sant. For lange samtaler, en del sånn der ting (...) Alt skal jo foregå på en radiokanal sant. Både innmelding fra bil og alt sånt. Det kan være et kapasitetsproblem der også (...) Det er jo helt klart. Det er jo hull.*

[xxiii] *Radiosambandet er jo analogt. Det er gammelt. (...) Så det er jo et kommunikasjonsproblem. Støy i forbindelse med radioprat gjennom nødnettet. Talekvaliteten kan være dårlig. Når det gjelder brann. Vi klarer ikke å oppfatte hva andre sier.*

[xxiv] *Det som er utfordringen ut på et skadested, det er å få lederne for de forskjellige funksjonene til å være på, eller i hvert fall å ha en sånn kommandoplass (...) at de er sammen og snakker sammen. Altså at innsatslederen fra oss er i sammen med utrykningsleder fagleder brann og operativ leder helse.*

[xxv] *Det som er utfordringen er det at de som er fagledere ute ikke etablerer et KO. Det er problemet for de folkene som er ute (...) Ja, nødetatene, det ser du gang etter gang at de greier ikke å etablere et KO, ikke et ordentlig et. De skal være nærmest mulig skadested og fare og springe mellom hverandre.*

[xxvi] *Det gjelder sånne tunnelulykker som jeg har vært på evaluering på, hvor de har vært i nærheten av tunnelåpningen og ikke hatt noen etablert KO-funksjon (...) Det har ikke nødvendigvis skjært seg. men de var heldige at det gikk bra da (...)Det er litt sånn kompleks det der, at en var heldig at det ikke brant mer enn det gjorde. For hvis det hadde vært mer så kunne man ha mistet både redningsfolk, eller ikke hatt kontroll på de da.*

[xxvii] *Det er veldig personavhengig hvem det er som er innsatsleder. Om det kommer en som er litt er strukturert, eller om det kommer en cowboy. Det har jo veldig mye å si (...) For det er jo han skadestedslederen som i prinsippet har alt å si. Og da må han gjøre ting ordentlig. Hvis han ikke gjør det så blir det tungt å jobbe for de som skal gjøre jobben da.*

[xxviii] *Det som ofte mangler er strukturerte møter i regi av skadestedsleder med en klar agenda som er kjent for fagledere og som blir fulgt opp ut i innsatsen på skadestedet og så tatt inn igjen med nye statusmøter det er et kjernepunkt hvor de har forbedringsområder (...) Hvis jeg skal vedde så er det gjennomgående for hele landet (...) Jeg skulle nesten ha veddet en årslønn på det (...) Men jeg har over 20 års yrkeserfaring og jeg har sett det der gang på gang.*

[xxix] *Ja, det er sånn med alle som skal lede noen ting, altså vi er jo forskjellige som personer så, det går på erfaring og det går litt på hvordan de er selv, og noen ønsker jo å lede ved å ha rådgiverne helt rundt seg, mens andre vil ha en modell hvor du har de lengre unna og, og i verste fall så vil de ikke ha de i det hele tatt, for å sette det på spissen ikke sant. Så det har vi jo sett. (...) Det er veldig uheldig. For eksempel, hvis du nå er innsatslederen og jeg er heimevernsmannen som er der, og jeg har med meg hundre stykker som jeg driver og styrer uti skogen. Hvis jeg sitter i den brakken der [peker på et hus utfor] eller i en bil på andre siden av plassen så da har vi jo på en måte brutt den kommunikasjonen. Altså, bare det å ha et fellessituasjonsbilde - "Hva er faktisk status ute nå?". Den oppnår vi ikke med å sitte på forskjellige bygg.*

[xxx] *Vi driver og stresser innsatslederne, at når du bestiller en ressurs, du vil ha Røde Kors eller du vil ha Sivilforsvaret (...) Det neste du da må gjøre, det er at du må tenke igjennom, "Okey, hva er det jeg skal bruke de til når de kommer frem". Og der har vi litt sånn forbedringssak. At bestiller du en vare, altså Sivilforsvaret, Norske Redningshunder, Røde Kors, eller hva det måtte være. (...) Så når du har bestilt det så må du kanskje på*

forhånd eller etter du har gjort det, tenke over, "hva er det jeg skal bruke de til, hva er behovene her nå" (...) Og det kan være en utfordring da.

[xxxi] *Jeg har også sett at de, når det går mot kveld for eksempel. så, da blir det stilt, da er det ingen som skjer, og så blir det oppmøte igjen på morgenen, og så får de oppdrag da. I stedet for at de kunne ha fått det oppdraget klokka ti om kvelden, hva de skal gjøre neste dag (...) Og så hadde de da kunnet ha forberede det da og forberedt mannskapene på hva de skal gjøre om morgen, så er de hurtig ute med en gang det blir lyst i stedet for at de begynner å planlegge igjen på morgenen. Og bruker tiden til det da.*

[xxxii] *Ja, da kan mye endre seg [ved vaktskifte], det kan bli en helt annen holdning, måten å gjøre ting på og sånne ting da. Det er litt for lite enhetlig ledelsessystem i politiet.*

[xxxiii] *Jeg tenker at i det øyeblikket du kommer til et skadested, hvis det skal være referansen for betenkningen, at du undervurderer potensialet i situasjonen. At du griper fatt i nå-situasjonen men at du ikke ser på hva slags potensial har det her. Kan skadestedet eskalere (...) Sånn at du undervurderer dimensjonering av ressurser for eksempel da kan det gå tap av menneskeliv. For eksempel, at du ikke har en god organisering av samleplass for skadde kan medføre tap.*

[xxxiv] *Det er ofte der det er utfordringer der du er i grenseland mellom "nei, det er ikke, vi må nok snart vurdere å sette stab" eller "jo, dette her begynner nå snart å bli så stort at vi burde gjort noen grep" så gjøres de kanskje hakket for sent da fordi at trykket er så stort at du har ikke rukket det ennå (...) Fordi at det blir litt sånn at den som roper høyest må du snakke med først og så rukket å verksette, altså du blir veldig i akuttfasen da (...) Så du har ikke rukket å iverksette det som gjøre for at du skal holde ut i tid da.*

[xxxv] *Det er jo et lite sånt ord at blant de som er ute på taktisk nivå, på bakken, ute og jobber på bakken, det er at, og litt på operasjonssentralen da, for at sitter der. At alt går så mye bedre når bare ledelsen har gått hjem (...) Og det er jo litt det med at når de som holder på i det daglig og takler hendelsene, de blir så gode, og de blir så samkjørte at dette her takler de, og de tørr å ta beslutningene. Er det noen på høyere nivå som er til stede så bringes spørsmål om beslutningen opp til dem. Så er ikke de vant til å ta beslutninger på samme måte. Så blir de nølende, og så blir det manglende beslutninger. Og det er litt av det man opplever når at man må ha et større apparat, et større stabsapparat til å takle en hendelse (...) De skal være en støtte, men oppleves da kanskje som nærmest en brems på det nivået som vanligvis takler det (...) Det blir uvant og usikkert. De som sitter i staben, som skal ta strategiske beslutninger, de blander seg helt ned på detaljnivå, for de er ikke vant til å gjøre, de vet ikke og tror ikke at innsatsleder og innsatsledelsen og operasjonssentralen i kommunikasjon med de øvrige her håndterer, takler, og får det ikke til. Så blir det sånn at de legger seg borti igjen, det de ikke trenger å legge seg borti.*

[xxxvi] *De som sitter i staben, som skal ta strategiske beslutninger, de blander seg helt ned på detaljnivå, for de er ikke vant til å gjøre, de vet ikke og tror ikke at innsatsleder og innsatsledelsen og operasjonssentralen i kommunikasjon med de øvrige her håndterer, takler, og får det ikke til. Så blir det sånn at de legger seg borti igjen, det de ikke trenger å legge seg borti.*

[xxxvii] *Det blir som en sånt, en stress, hvis at det er jeg som er innsatsleder da kommer til et stort ulykkessted (...) Og så springer jeg ut av politibilen og så begynner jeg å dirigere trafikk, du skjønner meg (...) Fordi at jeg er så stressa at jeg klarer ikke å gjøre det jeg skal. Jeg gjør det som er enklest. Det er å dirigere trafikk (...) Ja, ikke*

sant konkret og greit,, i stedet for å ta hånd om situasjonen (…) Og det samme gjelder en sånn utrykningsleder for brann, for det er den klassiske ikke sant. Huset brenner og folk roper osv. Og han klarer ikke å lede det. Han springer bare å får tak i en brannslange så står han å spyler vann på huset. Ikke sikker man trengte å ha vann der heller, ikke sant (…) Altså, han blir så stressa.

[xxxiii] *Vi er flinke på varsling, men så stiller jeg spørsmålstegn med hvordan er vi flinke til å kommunisere videre i en hendelse (…) sånn i starten. og gi viktig opplysninger (…) Det er vel det at vi blir veldig opptatt da av det som har skjedd (…) Altså, så går det jo ganske fort da, altså vi har ikke de voldsomme, i hvert fall ikke her i Trondheim da, men kommer du til distriktene så har du jo større avstander. Men det tar jo kort tid før en eller annen utrykningsetat er på stedet.*

[xxxix] *I tunneler vet du, så er det montert en sånn felles redningskanal (…) Redning 2 som vi kaller den (…) Der ambulanse, brann, politi jobber sammen, inni tunnelen (…) og litt utenfor. Og det sier dem det at "det er bare, det e bare dritt, fungerer ikke" (…) "Nei, bare skit" (…) Og så avdekker vi, hvorfor er det det, hvorfor sier dere det, og vi tester jo dette her og det fungerer jo som søren (…) Men da ser du det at man bruker den så sjelden så en vet liksom ikke "hvordan er det vi finn den på den bærbare radioen vi har."*

[xl] *Jeg har opplevd at både våre egne mannskaper som har vært litt eldre har snakket med politi med hypoteser da, det har og skjedd med hunder, det har og skjedd med heimevern, som har vært veldig bastant før du i det hele tatt vet området og hvor de skal gå hen faktisk. Det er veldig imponerende [ironi], uten at de vet noen ting. Og da liksom prøver å få solgt inn det til politiet som da kommer til oss i KO.*

Appendix A: Interview guide (pilot interview)

BAKGRUNNSINFORMATION

Arbeidserfaring

Antall år i yrket?

Stillingskategori? (leder, mellomleder etc.) - Antall år i nåværende stilling?

Ansvar/arbeidsoppgaver?

DEL 1: Erfaringer fra kriser – Problemer og utfordringer relatert til samhandling, kommunikasjon og beslutningstaking.

1. Hvilke erfaringer har du fra større hendelser/kriser?

2. Kan du beskrive en kategori større hendelser/kriser der du har deltatt i arbeidet?

□ Naturkatastrofe □ Kriminell handling (ran, terrorisme etc.)

□ Industriulykke □ Sosial uro (demostrasjon etc.)

□ Større transportulykke □ Større brann

□ Annet

Hvilke utfordringer opplevde du i forhold til dette arbeidet?

3. Hvilke(n) situasjon(er) vil du si byr på størst utfordringer?

□ Naturkatastrofe □ Kriminell handling (ran, terrorisme etc.)

□ Industriulykke □ Sosial uro (demonstrasjon etc.)

□ Større transportulykke □ Større brann

□ Annet

Hvilke faktorer vil du si er bestemmende for at denne/disse situasjonene fremstår som den/de mest utfordrende?

4. Hvilke problemer står din organisasjon overfor i operativt krisearbeid?

5. Hvordan vil du beskrive kommunikasjon og samhandlingen horisontalt i forhold til andre enheter på skadested?

a) Hva fungerer bra?

b) Hvor ligger utfordringene?

6. Hva med kommunikasjon vertikalt?

a) Hva fungerer bra i kommunikasjon vertikalt?

b) Hvilke utfordringer har du opplevd i forhold til kommunikasjon vertikalt?

7. Hvilke –

a) koordineringsutfordringer har du opplevd i arbeidet med større hendelser/kriser?

b) samhandlingsutfordringer har du opplevd i arbeidet med større hendelser/kriser?

c) beslutningsutfordringer har du opplevd i arbeidet med større hendelser/kriser?

8. Har du hørt fra andre om situasjoner der det har vært spesielle problem relatert til kommunikasjon? Hva med koordinering, samhandling, beslutninger?

DEL 2: Hypotetiske scenarioer

9. Hva tenker du vil kunne være potensielle problemer i arbeid med kriser/større hendelser?

a) I forhold til egne oppgaver?

b) Generelt?

10. Kan du tenke deg én eller flere situasjoner kan være spesielt utfordrende i arbeid i kriser/større hendelser?

a) Er din organisasjon, slik den er i dag, tilstrekkelig for å kunne håndtere en slik situasjon/slike situasjoner?

b) Hva skal til for å kunne håndtere situasjonen?

Andre kommentarer:

- Har du noe å tilføye?
- Er det noe viktig du mener at jeg har gått glipp av?
- Viktig informasjon jeg ikke har fått med?

Appendix B: List of probes

- Hva mener du?
- Kan du utdype det?
- Kan du si noe mer om X?
- Kan du eksemplifisere det?
- Du nevnte at X, kan du si noe mer om det?

Spørreord: Hva, hvordan, hvor, når, hvilken, hvorfor.

Appendix C: Interview guide (main interviews)

BAKGRUNNSINFORMATION

Arbeidserfaring

Antall år i yrket?

Stillingskategori? (leder, mellomleder etc.) - Antall år i nåværende stilling?

Ansvar/arbeidsoppgaver?

DEL 1: Erfaringer fra kriser – Problemer og utfordringer relatert til samhandling, kommunikasjon og beslutningstaking.

1. Hvilke erfaringer har du fra større hendelser/kriser?

2. Kan du beskrive en kategori større hendelser/kriser der du har deltatt i arbeidet?

□ Naturkatastrofe □ Kriminell handling (ran, terrorisme etc.)

□ Industriulykke □ Sosial uro (demostrasjon etc.)

□ Større transportulykke □ Større brann

□ Annet

- Hvilke utfordringer opplevde du i forhold til dette arbeidet?

3. Hvilke(n) situasjon(er) vil du si byr på størst utfordringer?

□ Naturkatastrofe □ Kriminell handling (ran, terrorisme etc.)

□ Industriulykke □ Sosial uro (demonstrasjon etc.)

□ Større transportulykke □ Større brann

□ Annet

Hvilke faktorer vil du si er bestemmende for at denne/disse situasjonene fremstår som den/de mest utfordrende?

4. Hvilke problemer står din organisasjon overfor i operativt krisearbeid?

5. Hvordan vil du beskrive operativ samhandling horisontalt i forhold til andre organisasjoner?

- Er det noen utfordringer knyttet til dette? Hvilke?

6. Hvordan vil du beskrive operativ kommunikasjon horisontalt i forhold til andre organisasjoner?

- Er det noen utfordringer knyttet til dette? Hvilke?

7. Hva med vertikal operativ samhandling i egen organisasjon?

- Er det noen utfordringer knyttet til dette? Hvilke?

8. Hva med vertikal operativ kommunikasjon i egen organisasjon?

- Er det noen utfordringer knyttet til dette? Hvilke?

9. Har du hørt fra andre om situasjoner der det har vært spesielle problem relatert til kommunikasjon? Hva med Samhandling?

DEL 2: Hypotetiske scenarioer

10. I forhold til kommunikasjon og samhandling, hva tenker du vil kunne være potensielle problemer i arbeid med kriser/større hendelser?

a) I forhold til egne oppgaver?

b) Generelt?

11. I forhold til samhandling og kommunikasjon, kan du tenke deg én eller flere situasjoner kan være spesielt utfordrende i arbeid i kriser/større hendelser?

a) Er din organisasjon, slik den er i dag, tilstrekkelig for å kunne håndtere en slik situasjon/slike situasjoner?

b) Hva skal til for å kunne håndtere situasjonen?

Andre kommentarer

- Har du noe å tilføye?
- Er det noe viktig du mener at jeg har gått glipp av?
- Viktig informasjon jeg ikke har fått med?

Appendix D: Informed consent form

NTNU
Norges Teknisk- Naturvitenskaplige Universitet

Fakultet for Samfunnsvitenskap og Teknologiledelse
Psykologisk Institutt

Informasjonsskriv/Samtykkeerklæring

STUDENT/FORSKER

Mitt navn er Håvard Gilja. Jeg er en masterstudent på det internasjonale programmet 'Risk Psychology, Environment and Safety' (Risikopsykologi, Miljø og Samfunnssikkerhet) ved Norges Teknisk-Naturvitenskapelige Universitet (NTNU) og er nå i gang med min avsluttende masteroppgave.

MASTEROPPGAVEN

Temaet for oppgaven er utfordringer knyttet til operativ krisehåndtering. Jeg ønsker å se nærmere på erfarte og potensielle problematikker knyttet til samhandling og kommunikasjon innad i egen enhet/organisasjon, og mellom enheter/organisasjoner, samt utfordringer vedrørende beslutningstaking i operative situasjoner.

For å finne ut av dette, ønsker jeg å intervjue ca 15 personer som har (operative) lederstillinger i respons enheter som politi, brann- og redningstjeneste, ambulanse, sivilforsvar, Norges Røde Kors, Heimevernet etc.. Studien vil utføres i Midt-Norge.

Spørsmålene vil i hovedsak dreie seg om oppfatninger om kommunikasjons- samhandlings- og beslutningsutfordringer ut fra de operative enhetens perspektiv. Intervjuet er todelt. Del én fokuserer på erfaringer fra kriser/større hendelser, mens del to dreier seg om hypotetiske problematikker.

OM INTERVJUET

Deltakelse i studien innebærer et intervju på ca én time. Det vil bli brukt båndopptaker og tatt notater under samtalen. Vi blir sammen enige om tid og sted.

FRIVILLIGHET

Undersøkelsen er frivillig, og du har når som helst mulighet til å trekke deg underveis. Dette kan gjøre uten noen videre begrunnelse. Dersom du beslutter å trekke deg vil all innsamlet data om deg bli slettet.

KONFIDENSIALITET

Det vil bli foretatt en utskrift og/eller skriftlig oppsummering av opptakene, og denne informasjon vil bli behandlet konfidensielt. Ingen enkeltpersoner vil heller kunne bli gjenkjent i den ferdige oppgaven. Informasjonen anonymiseres og alle opptak blir slettet etter ferdigstillelse av oppgaven.

Ønsker du å delta på intervjuet, setter jeg pris at du skriver under på samtykkeerklæringen og sender den adressen under.

KONTAKTINFORMASJON

For spørsmål og andre henvendelser kan jeg kontaktes på telefonnummer: 93 27 69 43, eller pr. mail: gilja@stud.ntnu.no. Dersom du ønsker det har du også mulighet til å kontakte min veileder ved psykologisk institutt, Britt-Marie Drottz Sjöberg på telefonnummer: 73 59 74 85, eller pr. mail: britt.marie.drottz.sjoberg@svt.ntnu.no

Denne studien er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste A/S.

Med vennlig hilsen

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Veileder

Professor Britt-Marie Drottz Sjöberg

……..	…..	…..
Sted	Dato	Navn

Appendix E: Translation of central terms (English – Norwegian)

English	Norwegian (Norsk)
Ambulance scene commander	Operativ leder helse
Central Norway Regional Health Authority	Helse Midt-Norge Regionale Helseforetak
Emergency medical communications centre	Akuttmedisinsk kommunikasjonssentral
Fire captain	Brannmester
Fire- and rescue service coordinator	Leder 110-sentral
Fire- and rescue service coordination centre	110-sentral
Fire- and rescue commander	Fagleder brann
Incident commander	Innsatsleder
Joint Rescue Coordination Center	Hovedredningssentral
Medical scene commander	Fagleder helse
Mobile Decontamination Team	Mobil renseenhet
Norwegian Air Ambulance	Norsk luftambulanse
Operations scene commander	Fagleder Politi
Operations leader	Operasjonsleder (politi)
Operation leader	Aksjonsleder (Røde Kors)
Peacetime Contingency Team	Fredsinnsatsgruppe
Police's operations centre	Politiets operasjonssentral
Rescue Sub-centre	Lokal redningssentral
Response Personnel Forum	Utrykningspersonellets fellesutvalg
Team commander	Lagleder (sivilforsvaret)
The chief of police	Politimester
The fire- and rescue service	Brann og redningsetaten
The Government Emergency Management Council	Regjeringens kriseråd

The Government Emergency Support Unit	Regjeringens krisestøtteenhet
The health service	Helsevesenet
The Norwegian Agency for Public Management and eGovernment	Direktoratet for forvaltning og IKT
The Norwegian Armed Forces	Forsvaret
The Norwegian Civil Defense	Sivilforsvaret
The Norwegian Directorate of Civil Protection and Emergency Planning	Direktoratet for samfunnssikkerhet og beredskap
The Norwegian Directorate for Emergency Communication	Direktoratet for nødkommunikasjon
The Norwegian Directorate for Emergency Planning	Direktoratet for sivil beredskap
The Norwegian Directorate of Health	Helsedepartementet
The Norwegian Home Guard	Heimevernet
The Norwegian Joint Headquarters	Forsvarets operative hovedkvarter
The Norwegian Ministry of Defense	Forsvarsdepartementet
The Norwegian Ministry of Health and Care Services	Helse- omsorgsdepartementet
The Norwegian Ministry of Justice and the Police	Justis- og politidepartementet
The Norwegian Ministry of Justice and Public Security	Justis- og beredskapsdepartementet
The Norwegian National Security Authority	Nasjonal sikkerhetsmyndighet
The Norwegian Red Cross Search and Rescue Corps	Norges Røde Kors hjelpekorps
The Norwegian Search and Rescue Service	Redningstjenesten
Official Norwegian Reports	Norges offentlige utredninger
Unified Leadership System	Enhetlig ledelsessystem